NARENDRA MODI

CONVENIENT ACTION

Continuity for Change

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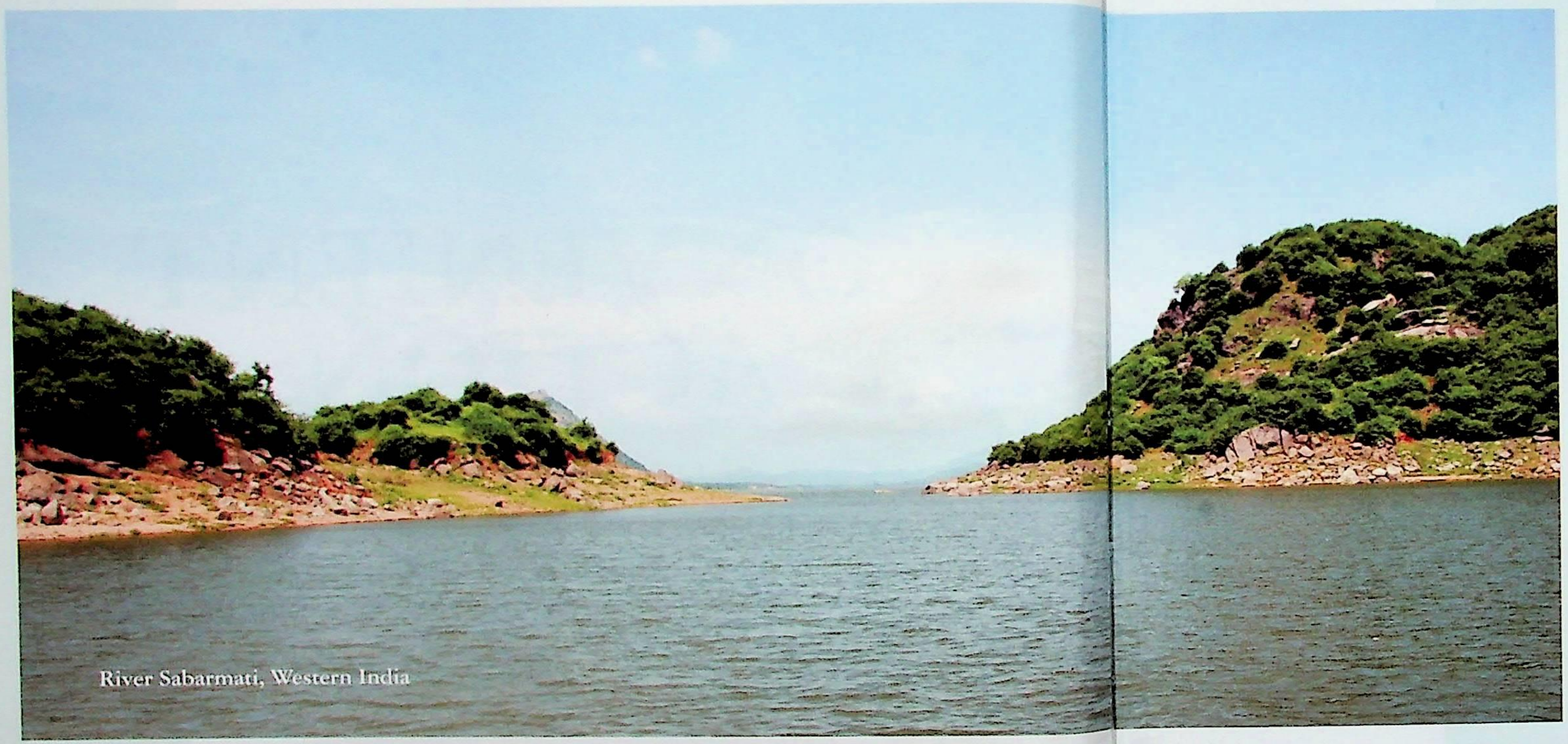
नाना जी देशमुख पुस्तकालय (भाजपा)
क्रमांक

CONVENIENT ACTION

Continuity for Change

NARENDRA MODI


River Sabarmati, Western India

“*In whom the sea, canals, lakes, wells, tanks, in whom our food and cornfields had their being, in whom this all that breathes and moves is active may this Earth (bhumi) grant us all excellent eatable and drinkable objects like milk, fruits, water and cereals.*”

Atharva Veda (A.V.) 12.1.3

यस्यां समुद्र उत सिन्धुरापो यस्यामन्नं कृष्टयः सम्बभूवुः ।
यस्यामिदं जिन्वति प्राणदेजत्सा नो भूमिः पूर्वपेये दधातु ॥ ३ ॥

“*... the purity in us is due to the Earth. The Earth is my mother and I (the seer) am Her son. Cloud is my Father, let that nourish us.*”

Atharva Veda (A.V.) 12.1.12

यत्ते मध्यं पृथिवि यच्च नभ्यं यास्त ऊर्जस्तन्वः सम्बभूवुः ।
तासु नो धेह्यभि नः पवस्व माता भूमिः पुत्रो अहं पृथिव्याः ॥
पर्जन्यः पिता स उ नः पिपर्तु ॥ १२ ॥

Nature as God

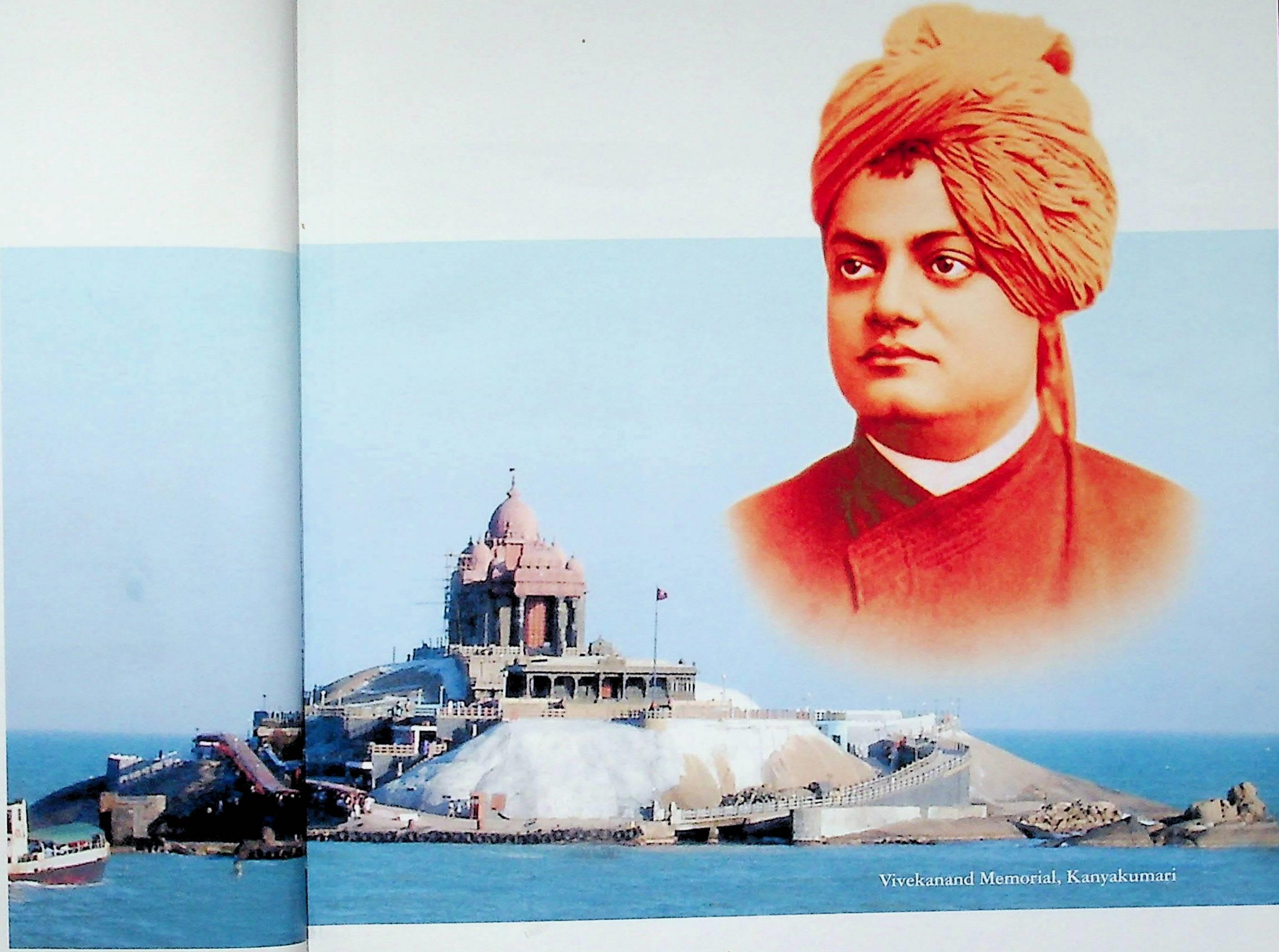
" *- and naturally the beauties and sublimities of nature captivate the attention of man first. The first questions that arose in the human soul were about the external world. The solution of the mystery was asked of the sky, of the stars, of the heavenly bodies, of the earth, of the rivers, of the mountains, of the ocean, and in all ancient religions we find traces of how the groping human mind at first caught at everything external. There was a river-god, a sky-god, a cloud-god, a rain-god; everything external, all of which we now call the powers of nature, became metamorphosed, transfigured, into wills, into gods, into heavenly messengers.* "

THE COSMOS *The Microcosm (Delivered in New York, 26th January, 1896), Complete Works of* **Swami Vivekanand,** *Volume 2.*

Sustenance of Nature - Basis of Existence

" *All nature is bound by law, the law of its own action; and this law can never be broken. If you could break a law of nature, all nature would come to an end in an instant. There would be no more nature.* "

SPIRIT AND NATURE *(Notes of Class Talks and Lectures), Complete Works of* **Swami Vivekanand,** *Volume 6.*



Vivekanand Memorial, Kanyakumari

> "One must
> care about
> a world
> one will
> not see."
>
> *Mahatma Gandhi*
> *(1869-1948)*

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Grateful

The earth is lovely
These eyes are grateful.

Here the sunlight pours onto lush green grass
Sunlight cannot be captured though.

The sky is gorgeous
And the earth is lovely.

The rainbow blossoming in the sky
Drawing circles of colour in the air.

Of which past birth these good deeds are?
Life is grateful, grateful.

The sea rocks up towards the sky.
Who knows what lies in the womb of clouds!

This nothingness is meaningful
The earth is lovely.

I have mingled with fair of human beings
And recognised myself in the company of others.

All this is unique
And something is mystical.

Grateful grateful grateful it is
My earth is lovely.

Narendra Modi
Source: Aankh Aa Dhanya Chhe, 2007

Climate Ethics

With my humble moorings in a small village ensconced in rural hinterland of Western India, I grew up in an atmosphere that was more in harmony with nature than the inhospitable, polluted and haphazard landscapes of big cities where I shifted in due course. Respect for nature was inextricably embedded in our culture at home, so much so that we were told by my mother to fold hands and ask for Mother Earth's forgiveness after getting up in the morning before putting our feet down on ground. This, I realised a few years later in life, was the social integration of the philosophy of Vedas in India. Vedas are the oldest repertoire of ancient knowledge. They have laid the foundation of Hindu religion and have provided an enlightened path of development of Hindu culture and lifestyle.

My views on complementary relationship between man and nature took definite shape when I studied the *Prithvi-Sukta* of *Atharva Veda* during my college days. The sixty-three Suktas, (couplets) composed thousands of years ago, contain a whole spectrum of knowledge which is now being propounded under various scientific, academic and analytical banners during discussions on global warming, damage to earth's environment and the resultant Climate Change. The underlying spirit is that of a mother-son relationship between man and earth; and the rain clouds that fill the earth with life sustaining water have been likened to the father. The bounties of nature in circulating waters of streams, seas and oceans, hills, snowy mountains and forests, all have to be guarded and replenished if used, so as to yield us a sustainable amount of food, milk and other agricultural products and ultimately bestow us with splendour, strength and brilliance. Sustainability is ultimately a moral issue since it involves the protection of interests of our future generations. Climate Change is definitely affecting the future generations which, as of now, have no voice on the actions of present generation. A UN report has termed this as 'unsustainable ecological debt' which our generation is running up for the future generations to inherit. The Suktas of *Atharva Veda* had embodied the very same message thousands of years ago:

उपस्थास्ते अनमीवा अयक्ष्मा अस्मभ्यं
सन्तु पृथिवि प्रसूताः ।
दीर्घं आयुः प्रतिबुध्यमाना वयं
तुभ्यं बलिहृतः स्याम ॥

Upasthāste anamēvā ayakhsmā
asmabhyam santu prithivi prasōtāhā |
Dērgham na āyuhu pratibudhyamānā
vayam tubhyam balihritaha syāma ||

"We aspire to live long, our children too would live long and be free from sickness and consumption. We all are reared up in the lap of the Mother Earth. May we have long life (provided) we are watchful and alert and sacrifice our all for Her."

Atharva Veda (A.V.) 12.1.62

भूमे मातर्नि धेहि मा भद्रया सुप्रतिष्ठितम् ।
संविदाना दिवा कवे श्रियां मा धेहि भूत्याम् ॥

Bhōme mātarni dhehi mā bhadrayā
supratishthitam |
Samvidānā divā kave shriyām mā
dhehi bhōtyām ||

"With an utter sense of ethics and dutiful attitude, we can live happily in an honourable position. It is reiterated that the revolving Earth, of one accord with the Sun sets the supersentient seer in glory and in wealth."

Atharva Veda (A.V.) 12.1.63

These hymns to the earth are not merely poetic statements but contain a short compendium for good governance:

याणविऽधि सलिलमग्र आसीद् यां
मायाभिरन्वचरन् मनीषिणः ।
यस्या हृदयं परमे व्योमन्त्सत्येनावृतममृतं पृथिव्याः ।
सा नो भूमिस्त्विषिं बलं राष्ट्रे दधातूत्तमे ॥

Yārnvedhi salilamagra āsēd yām
māyābhirnvacharn manēshinah |
Yasyā hridayam parame
vyomansatyenāvritamamritam
prithivyāhāh |
Sā no bhōmistvishim balam rāshtre
dadhātōttame ||

"The Earth whose heart dwells in the supreme heaven, enveloped in truth and immortality. May the Earth grant us brilliance and strength for the highest form of governance."

Atharva Veda (A.V.) 12.1.8

जनं बिभ्रती बहुधा विवाचसं नानाधर्माणं
पृथिवी यथौकसम् ।
सहस्रं धारा द्रविणस्य मे दुहां
ध्रुवेव धेनुरनपस्फुरन्ती ॥

Janam bibhratē bahudhā
vivāchasam nānādharmānam
prithivē yathaoukasam ।
Sahasram dhārā dravinasya me
duhām dhruveva
dhenuranapasfurantē ॥

"Who carries manifold peoples of different languages and different ways of life, as their single home. May the wide Earth grant us a thousand streams of abundance that flow steadily like the milk from an inexhaustible milk-yielding cow."

Atharva Veda (A.V.) 12.1.45

The ethical and spiritual principles that we as human beings strive for are not our own invention, but exist at the very heart of the planet on which we live. Truth is the foundation of the Earth, not simply something we arrive at through various forms of study, debate or experiment. The Earth manifests the virtues of humility, selflessness and equanimity, but also indicates creativity, vitality and endurance. If we follow the example of the Earth in our human interacations, there will be abundance for all.

Unless we first link to the consciousness of the Earth when we consider our social and economic policies, our actions are likely to be limited and potentially harmful. We can discover the highest human values through contemplating on the bounty, generosity and kindness inherent in the Earth itself. The Earth is not just a physical world but is the manifestation of a higher ideal and aspiration with its roots in the heavens above. To rule the Earth in a benefic manner, we must rule the world through the consciousness of the planet herself.

We should not seek to impose our desires or opinions on the Earth but learn the wisdom through which the Earth naturally operates as the Mother and support of all life. If we want to know how to govern the world properly, we should look to the deeper intelligence that is inherent in nature.

The Earth has nurtured and provided for a great variety of creatures, great and small, without discrimination, including a great diversity of human beings and human cultures, offering all creatures a common home. We should learn from this attitude of equality, wideness and grace.

The ancient Vedic insights carry important ecological considerations. When we think of ecology, we should think of the Earth as a whole, not just from a scientific, technological or economic perspective, but as the personification of the life and aspiration of all creatures here. It is not just a matter of finding the material resources to help us build a better technology but of upholding the fabric of life, where each creature has its own sacred place. Protecting our ecology has many benefits socially, politically, and economically, but is also part of our greater responsibility as a species – to nurture the planet that nurtures us. If we fail to honor our spiritual commitment to the nature around us, it puts our very planet and our species itself at risk and for generations to come. To be true human beings we must treat every creature humanely. We must remember that we live in an unbounded universe of cosmic forces that rule over the eons. Let us not get caught in merely seeking short term profits or electoral gains when we frame our policies today. Let us formulate policies that can endure throughout the ages and gain greater relevance with every passing generation. Let once more through honoring the Earth connect ourselves and our cultures to the universe as a whole.

Let us not forget the legacy of the many great visionaries, ancient and modern, who have endeavored to connect us with the whole of life. Then we can develop a future for our planet that will not only be sustainable, but will create abundance at physical, cultural and spiritual levels. Let us work with nature in such a way that we ennoble both ourselves and our environment, adding not simply material gains to our outer lives but a deeper refinement, beauty and consciousness to society and to the Earth itself.

As we have entered an era of global communication through the internet and the social media, let us remember that this vast information network is but a small part of a much vaster network of communication extending to the entire universe - and this is rooted both within our own hearts and in the very ground on which we stand. We should not underestimate our current environmental problems or ignore them, but must use them as a compelling call to improve both our world and ourselves according to a universal vision. It is only by becoming responsible citizens of the Earth that we gain the right to enter the greater universe of consciousness.

One of the beautiful verses of *Rig Veda* says:

द्यौर्मे पिता जनिता नाभिरत्र बन्धुर्मे
माता पृथिवी महीयम् ।

Dyaurme pita janitā nābhiratra
bandhurme mātā prithivē mahēyam I

"Heaven is my father,
brother atmosphere is
my navel and the great
earth is my mother"

Rig Veda (R.V.) 1.164.33

Heaven and earth are parents: Matra, Pitra, Janitra (*Rig Veda,* 1.159.160) in union while separately called as father and mother. They sustain all creatures. They are parents of all Gods.

Rig Veda has also emphasised on the importance of Panch Tatvas (five elements) namely *Prithvi* (earth), *Pavan* (air), *Jal* (water), *Tej* (solar energy) and *Nabh* (sky) and has maintained that the entire life systems on earth are based on harmonious functioning of these five elements. Therefore, sustainable use of these natural elements has been consistently advocated in all ancient Indian scriptures like the *Rig Veda, Manu Smriti, Yagyavalkya Smriti,* etc. It has, time and again, been emphasised in these scriptures that man should use these heavenly gifts in such a way that no long term damage is caused to them. The energies and benefits derived proportionately from these five elements will only sustain life and preserve mother earth. Any disproportionate exploitation of these energies will cause pollution and will promote selfishness, instincts of violence, jealousy – inimical to human development. And this is precisely what has happened during the last hundred years and has disturbed the natural equilibrium.

Buddhist philosophy based on cycle of rebirth in different yonis or species to attain ultimate *Nirvana* (Enlightenment) also embodies concern for well being of humans as well as that of planet. In the Buddhism formulation of Panchasheel, one has to refrain from the destruction of all forms of life. Buddhist wisdom encompasses the tenet of sustainability in man's interaction with nature. It is clearly postulated that famine, epidemic and violence shall result as a consequence of human greed and moral degeneration.

Further, based on the above observations and postulations the Buddhist wisdom necessarily points to the sustainable use of nature keeping in mind the interest of future generation and other living beings underlying the Buddhist ethics as is embodied in the famous *Dhammasangani* quotes:

Katame dhammā akusalā? Tīṇi
akusalamūlāni – lobho, doso, moho;
tadekaṭṭhā ca kilesā; Taṃsampayutto
vedanākkhandho, saññākkhandho ,
saṅkhārakkhandho,
viññānakkhandho;
taṃsamuṭṭṭhānam kāyakammaṃ,
vacīkammaṃ, manokammaṃ –ime
dhammā akusalā.

"All evil actions spring
from the three evil
roots, namely, Avarice
(lobha), malice (dosa)
and nescience
(ignorance);
All good actions
originate from the three
moral roots, namely,
Loving kindness,
sacrifice and wisdom."

Dhammasangani I (ii)(986)

Buddhist scholars have gone to the extent of interpreting Buddhist notion of reincarnation aimed at generating consciousness amongst humans for conservation of nature and its sustainable use since we shall be born and reborn again and again on this planet; we have a moral responsibility to preserve and conserve it for posterity.

Venerable Bhikku Bodhi, in an address at United Nations, rightly pointed out that due to prevalence of greed the world has been transformed into a global market place where people are reduced to status of consumers and earth's precious vital resources are being pillaged without any concern for future generations. He gave a clarion call to outgrow the egocentric and ethnocentric attitudes and adopt a "worldcentric ethics" by replacing exploitative greed with global generosity, helpfulness and cooperation.

Venerable Bun Saluth said:

"The Buddha was born
under the tree, attained
enlightenment under
the tree and died under
the tree. So a tree is a
symbol of life and
sacred to Buddhist."

Venerable *Bun Saluth*

Putting environmental ethics into action monks in Cambodia have assiduously protected thousands of hectares of forests, now called as Monk's Community Forest.

Shantideva, an Indian Buddhist scholar many centuries ago preferred a life in forest to that in a monastery:

"When shall I come to
dwell in forests
Amongst the deer, the
birds and the trees,
That say nothing
unpleasant
And are delightful to
associate with?"

Shantideva, Bodhiaryavatara VIII,
Trans. Stephen Batchelor, A guide to
the Bodhisattva's way of Life,
Liberty of Tibetan Works and Archives,
Dharamsala, 1979

Milarepa (the Tibet's great yogi-saint) said :

"This is a delightful
place, a place of hills
and forests.
In the mountain-
meadows flowers
bloom;
In the woods dance the
swaying trees!
For monkeys it's a
playground.
Birds sing tunefully,
bees fly and buzz,
And from day until
night the rainbows
come and go.
In summer and winter
falls the sweet rain,
And mist and fog roll up
in fall and spring.
At such a pleasant
place, in solitude,
I, Milarepa, happily
abide,

Meditating upon the
void-illuminating
mind."

Milarepa, Trans. Garma C.C. Chang,
The Hundred Thousand Songs of
Milarepa, Vol.1,
Shambala, Boston, 1989

HH the Dalai Lama, very aptly, epitomizes the environmental ethics of Buddhism in his 1989 Noble Peace Prize speech :

"Today more than ever
before, life must be
characterized by a
sense of Universal
Responsibility, not only
nation to nation and
human to human, but
also human to other
forms of life."

HH The Dalai Lama.
Cited in Martin Palmer, Anne Nash and
Ivan Hattingh,
Faith and Nature, London, 1988

He, further, says:

"The earth is home to
living beings;
Equal and impartial to
the moving and
unmoving.
Thus, spoke the Buddha
in truthful voice
With the great earth for
witness;
As a noble being
recognizes the kindness
Of a sentient mother
And makes recompense
for it,
So the earth, the
universal mother,
Which nurtures all
equally,
Should be regarded
with affection and
care."

His Holiness the Dalai Lama, On the
Environment; Collected Statements,
The Department of Information,
Dharmasala, p.59-60

Other ancient philosophies like Jainism, Sikhism, Taoism and Shintoism and peoples of the world had also realized the mutually related and mutually dependent nexus between nature and humans. All ancient faiths and peoples had revered nature as the manifestation of the divine. All ancient philosophies position the humans as merely one of the millions of birds and animals and plants and species. The entire living organism right down to the tiniest atom was spiritually seen as integral to humans as part of their being. They were no natural or biological assets. They were all objects of reverence and even worship. Thousands of rivers, lakes and ponds, mountains and species including wild animals were revered and worshipped. This environmental consciousness is at the root of what is now known as the Traditional Environmental Knowledge (TEK).

For thousands of years, the native peoples around the world have used knowledge of their local environment to sustain themselves and to maintain their cultural identity. But the modern science in pursuit of economic development sans environmental consciousness had anyhow trivialized the traditional wisdom of the people to the prejudice of both environment and economics. Only in the past decade has this knowledge been recognized by the Western scientific community as a valuable source of ecological information. Today, a growing body of literature attests not only to the presence of a vast reservoir of information regarding plant and animal behavior but also to the existence of effective indigenous strategies for ensuring the sustainable use of local natural resources.

It would be relevant to mention here Mahatma Gandhi's concept of Trusteeship which was basically propounded in the colonial context. This concept exhorted the rich to use their wealth only for fulfilling the right to an honourable livelihood no better than that enjoyed by millions of others. The rest of the wealth should belong to the community and must be used for the welfare of the community. To apply the concept of trusteeship in the context of Climate Change, I firmly believe that our present generation should act as trustees for the wealth of nature and should use it only in a sustainable way so that it can also be enjoyed by many generations to come. Mahatma Gandhi was absolutely right when he said that everything belonged to God and was from God and hence no individual is entitled to more than his proportionate portion and, therefore, he became a trustee of the rest of proportion for God's people. Unfortunately, the reckless destruction of ecological harmony has heightened the responsibility of our generation and specially those living in the developed world to act as trustees in the real sense of the term for future generations.

Therefore, ethics and equity in my view are at the core of debate on Climate Change.

The 'Fit All' development model, consistent with modern anthropological paradigm led to post World War II belief that rapid economic progress was impossible without painful adjustments. The Cartesian view that human kind's task is to make itself the master and possessor of nature using science and technology led neo classical economics to become largely anthropocentric. Those holding this view believed that only human beings possess intrinsic value and therefore moral standing. Because human are transcendant all other plants and inanimate objects are subservient to fulfilment of human goals, anthropocentricists felt. The insistence of modern anthropological approach for uniform and homogeneous economic development model led to the process of under emphasizing the respect for indigenous knowledge, culture and traditional practices and their age old contribution to sustainable and equitable development and conservation of environment. The results have not been encourging in last few decades –increasing income inequality, abject poverty and unprecedented loss of ecological wealth. The long held view that economic growth would contribute to containing the environmental degradation, which has generally made many policy makers to trust that growth itself would take care of environment, has been seriously questioned by recent studies. The studies have also shown that income inequality within a nation more adversely affects environment. A latest study even concludes that while all growth inflicts damage on the earth's ecological carrying capacity, growth which is more equitable is relatively less damaging.

Gradually during last few years many have realized that there is no one model that 'Fits All'. The UN declaration on the Rights of Indigenous People, endorsed by the UN Human Rights Council in the year 2006 recognised this. In June, 2013 during the General Assembly debates, the Secretary-General, Ban Ki-moon stressed the need to recognize that there is no "one-size-fits-all" development model. And the Secretary General went further to declare the importance of culture in development. He said, "It is not enough to set global targets for all – we need to adapt to each context. Too many well-intended development programmes have failed, because they did not take cultural settings into account. This must be an overarching principle for all development efforts." He further said, "Development has not always focused enough on people. To mobilise people, we need to understand and embrace their culture. This means encouraging dialogue, listening to individual voices, and ensuring that culture and human rights inform the new course for sustainable development. The fundamental role of culture was not fully acknowledged within the MDGs - as a goal, an overarching principle, or as an enabler."

Regulations alone are not adequate to protect environment. An environmental philosophy is needed to protect environment. It is a product of cultural anthropology that prevents deviance, whereas regulations are a consequence which punish deviance. Environmental consciousness is more important than environmental regulations. Increasingly while the nation-specific character of economic development – the people, their culture, traditions, and other behavior and value systems included – is accepted, there is as yet no clear formulation of an environment philosophy based on diversity for the environment multilateralism. The mainline view advocates Market-based instruments (MBI), such as environmental taxes, tradable permit systems or targeted subsidies, as a cost-effective way to protect and improve the environment, since they incentivize firms and consumers to opt for greener production or products. The entire environment and development debate centers around government and regulation. Environmental values and behavior are products of philosophy that connects environment with the people, their culture and belief systems which restrain people's greed and act as a restraint on their consumption. While market economics would promote consumption that damages environment on the one hand and rests on regulation and taxes to safeguard the environment on the other. The world needs to shift to a paradigm of environmental philosophy which will inculcate environmental consciousness and influence the lifestyle of the people and would act as a restraint from within.

This would call for a greater role for Eastern thought systems which have kept alive the lifestyle based on traditional environmental knowledge founded in their philosophies.

Today, the best safeguard for environment is the traditional communities and their traditional knowledge and belief systems which were many decades ago regarded as sign of underdevelopment and an impediment to development. The extent to which traditional beliefs can motivate communities to sacrifice for environmental conservation is reflected in deep seated commitment of Bishnois (a small community in State of Rajasthan in India) to protect wild life and trees. They practise environmental conservation as part of their religious duty. The founder of this sect formulated twenty nine injunctions. Principal among them was a bar on the cutting of any green tree and killing of any animal or bird. And in the beginning of 18th century hundreds of men and women of Bishnoi community reportedly sacrificed themselves to prevent felling of trees at the altar of royal greed. The Bishnois people's defence of the natural environment needs to be more widely known as one of the world's classic instances of martyrdom in defence of the environment. What will ultimately save environment is only environmental consciousness. This requires a philosophic inspiration which could influence not only the thinking of the humans but their conduct, lifestyle and habits and inspires adoption of restrained behaviour.

In India we can find umpteen instances of local communities and traditional cultures conserving the environment. Many tribal communities in North Eastern part of India fulfill their daily requirements from relatively small catchment areas; yet fiercely following certain rules to protect the environment. Thus, they provide sterling examples of living in complete harmony with nature. Scholars have studied and documented Demazong (the Buddhist eco-cultural landscape in Sikkim Himalayas) and Apatani (eco-cultural landscape in Arunachal Pradesh) which illustrate the value of traditional culture and ecological knowledge in sustaining natural resource management. The environmental consciousness of Meetei communities in States of Manipur and Assam in India is reflected in protection of Umang Lais – Sacred groves as they are known in their mother tongue. These groves are home to variety of flora and fauna like teak, eucalyptus, bamboo, lemon and fish, waterfowl and other aquatic animals. But Meeteis refrain from eating them during certain periods with the singular objective of sustaining and conserving the natural wealth. The cultural anthropological traditions of India are eco-centric (centred on ecology) and not anthropocentric (centred on man). They prevent environmental deviance by restraining environmental violations from within.

A few years ago, I used to read a lot of sceptic views on Climate Change, whether or not it was actually happening. Having been in public life I am aware of behind-the-scene lobbying by vested interests that normally accompany any such carefully orchestrated campaigns. But even in those days of uncertainty and confusion, I based the formulation of public policy on my conviction of complementary relationship between man and nature. This helped me to clarify my thoughts and to choose a developmental path that would lead to empowerment of the poor and downtrodden in a way that would make the sustainable use of the bounties of nature. It was only after following consistently, for many years, the developmental philosophy as Chief Minister of a State (with around 196,000 km^2 area and around 55 million inhabitants) that I decided to document these successful experimentations.

This book, therefore, is only a humble attempt to document, initiatives and innovations that we have undertaken and experimented in Gujarat and now in India that have directly or indirectly but significantly contributed and will continue to contribute to the adaptation and mitigation of Climate Change. It should, in no way, be looked upon as a stereotype, or a governmental propaganda to highlight a political leader's achievements. Having been an ardent follower, for about five decades, of a nationalistic ideology based on strong foundations of sacrifice, selfless service and cultural conviction, I have been inspired to do and follow what is morally correct and beneficial to mankind at large. Therefore, this book apart from documenting our multidimensional initiative, is also an open and polite invitation to the world community of scholars, researchers, scientists, leaders and policy planners to visit my country, experience and feel the impact, and measure and judge them against any yardsticks of scientific and analytical scrutiny.

Dichotomy between dominant interventionist model of development and decentralised participative model had been in my mind when I started my development journey in Gujarat. I have attempted to turn this conflict into cooperation by a synthesis of both strategies in my model of Gujarat development. There were many areas and sectors where I realised that stand-alone initiatives by Government would neither address the problems effectively nor would result in sustainability or even create a sense of belonging. In particular, dealing with water scarcity in parched lands of Saurashtra region (South western Gujarat) by creating a sustainable network of micro irrigation and recharge structures; was a challenge that could only be handled by mass participation supplemented by financial and technical support provided by Government. In this case, I could synthesise two development approaches mentioned earlier. Resultantly, a solution was found to drinking water and irrigation needs of millions of people, recharge of depleted ground water resources and revival of surrounding ecology by hundreds of oasis in those dry regions of Gujarat. In retrospect, within a Climate Change paradigm, this has definitely improved water availability and quality, increased soil fertility and thereby agricultural productivity (from a single rain-fed crop a year to three crops per annum in many cases) and led to betterment in air quality by arresting the trend of desertification of lands in these areas. To put into proper perspective, what I am referring to here is an area covering around 142,700 km^2 with 27.63 million inhabitants. This initiative of development of community based infrastructure for water harvesting has reduced vulnerability and empowered people to cope with Climate Change impacts in my State and has come in for a special mention in UNDP Human Development Report 2007-2008.

But replacing the use of gasoline by a more environment friendly alternative – Compressed Natural Gas (CNG) in large number of vehicles in Gujarat required direct intervention from the Government in order to create an infrastructure of supply and distribution. In just a span of two years, we converted more than three hundred thousand vehicles into CNG and achieved remarkable results in improving ambient air quality in the city of Ahmedabad with four million inhabitants. This has been an initiative with definite Climate Change mitigation overtones. Similarly, turning the largely Government dominated State capital Gandhinagar into a solar city by captive solar and wind energy production for Government usage, again required direct intervention. Hence, this queer admixture of two development strategies, otherwise thought by many to be mutually exclusive, has enabled me to accomplish several initiatives with Climate Change adaptation and mitigation potential.

UN Secretary General, Ban Ki-moon got a very strong case of action prepared and published in Human Development Report, 2007, for fighting Climate Change. A very timely plea indeed for governments, institutions and stakeholders world over. And seven years later in his opening address in UN he warned that humanity has never faced a greater challenge than climate change when the world leaders gathered in New York in September, 2014. My attempt to prepare this compendium of action taken, thus far, is only an extension of that plea in order to inspire all those concerned, that within a democratic framework and despite electoral constraints things can and will happen if they are planned and executed with single-minded devotion to a larger cause and with a firm determination to fight Climate Change.

Al Gore was right when he commented many years ago that it was inconvenient to many leaders to hear, face and accept the naked truth of Global Warming. I would go further by saying that the real test of leadership is not only in welcoming this truth but also in devising, formulating and implementing a strategy that results in what I call decisive, appropriate, timely and 'convenient action' to deal with this truth and the challenges that it has thrown.

When I wrote Convenient Action in the year 2010, which was launched by late Dr. A. P. J. Abdul Kalam, former President of India, I had drawn mainly on multidimensional actions we undertook in Gujarat during the previous decade as a response to challenges of Climate Change. In fact, some of these consciously happened many years before well documented 5th Assessment Report of IPCC. Little did I realize then that one day God and people of India will bestow upon me the opportunity to upscale these actions on a national level and make it India's response to challenges of Climate Change.

During the last one year while we may have taken unprecedented steps to revive India's ailing economy, create more jobs, encourage domestic manufacturing sector and design far reaching long term structural reforms; I have not lost sight, even for a day, off my passion for environmental sustainability and consciousness to deal with challenges of Climate Change.

One year is definitely not enough to reap far reaching fruits. However, with an updated information on Gujarat, I have delineated towards the end of this book, a series of actions and policy measures that have been initiated during the last one year which will have definite and incremental effects on our preparedness to deal with climate shocks in future.

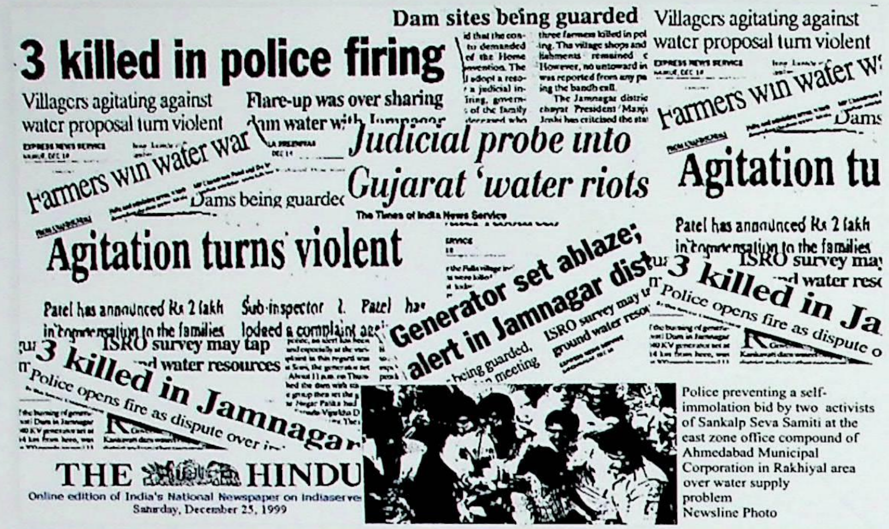
I pray the Almighty to bless me with opportunity and strength to enumerate these actions and their impacts in greater details a few years down the line again.

I have penned this revised, updated version with a great deal of hope while I go to COP 21 in Paris to join other world leaders in our efforts to save the planet for our posterity.

Narendra Modi
Prime Minister of India

from water riots to water security

Water Riots in Gujarat



Dam sites being guarded

3 killed in police firing

Villagers agitating against water proposal turn violent

Flare-up was over sharing dam water with Jamnagar

Farmers win water war

Dams being guarded

Judicial probe into Gujarat 'water riots'

The Times of India News Service

Agitation turns violent

Patel has announced Rs 2 lakh in compensation to the families

Sub-inspector lodged a complaint

ISRO survey may tap ground water resources

Generator set ablaze; alert in Jamnagar dist

3 killed in Jamnagar

Police opens fire as dispute over

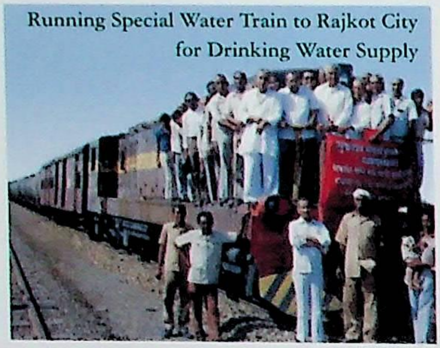
THE HINDU

Online edition of India's National Newspaper on indiaserver

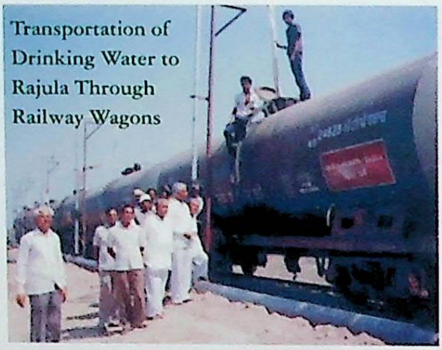
Saturday, December 25, 1999

Police preventing a self-immolation bid by two activists of Sankalp Seva Samiti at the east zone office compound of Ahmedabad Municipal Corporation in Rakhiyal area over water supply problem

Newsline Photo



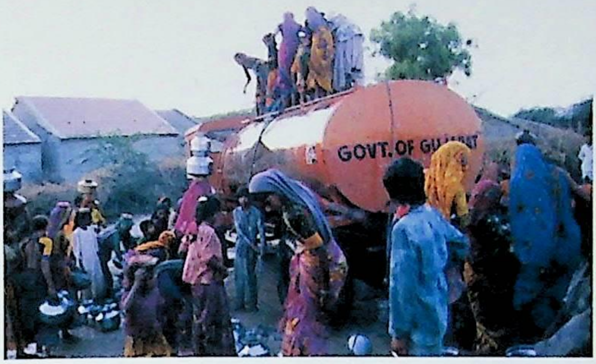
Running Special Water Train to Rajkot City for Drinking Water Supply



Transportation of Drinking Water to Rajula Through Railway Wagons

Before the year 2001 drinking water scarcity had posed serious threat to human and cattle lives in Gujarat State. Successively, Governments had to spend billions of rupees on temporary measures to supply drinking water by road tankers and some times even through special water trains. The State, which generally had a track record of peace and cooperative social ethos, even witnessed 'water riots' due to severe water scarcity compounded by poor water resources management.

Lack of access to safe drinking water, time loss in collecting available water, effects of head loading and the burden of household responsibilities – all cause detrimental effects on the health of women and general family welfare including their income-earning abilities.



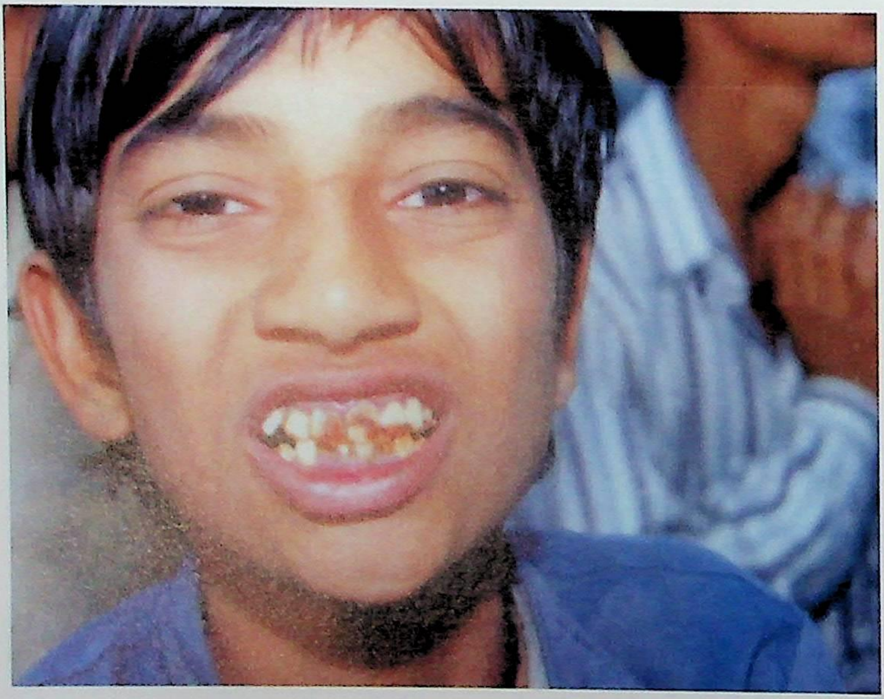
Women Struggle for Water in Rural Areas

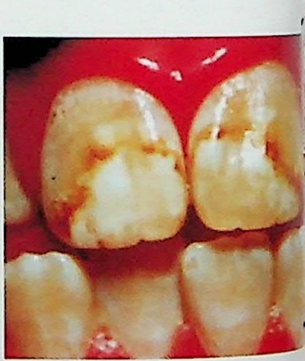
Daily Drudgery of Women

Long Queues for Water

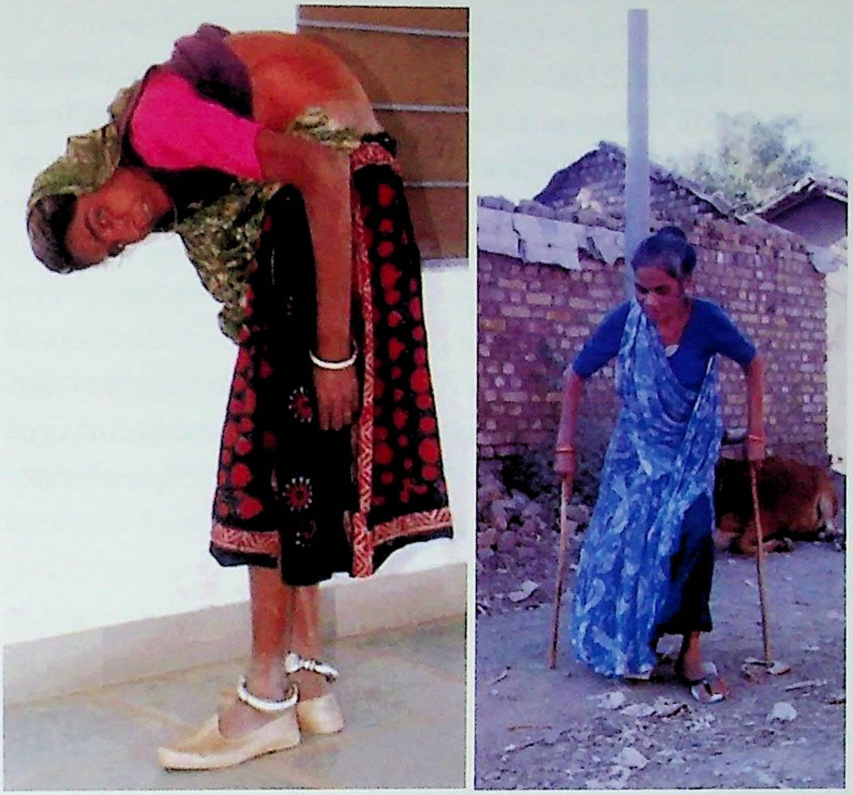
Over drafting of ground water (as compared to annual recharge) caused serious water quality problems due to excessive fluoride, nitrate and salinity. The number of fluoride affected habitations increased from 2,826 in the year 1992 to 4,187 by the year 2003.

The fluoride concentration in these villages ranged from 1.5 mg/litre to as high as 18.90 mg/litre. Fluoride has been the cause of extensive health damages in many parts of Gujarat. Dental fluorosis causes permanent pigmentation of teeth in children and bone deformities are caused by skeletal fluorosis even in adults. Other serious problems experienced due to high concentration of fluoride have been aneamia, loss of appetite, nausea and thyroid malfunction which sometimes results in brain impairment of children and adverse impact on foetus, in some cases causing abortion or stillbirth in expectant mothers.





Future Generation Permanently Deformed by Dental Fluorosis

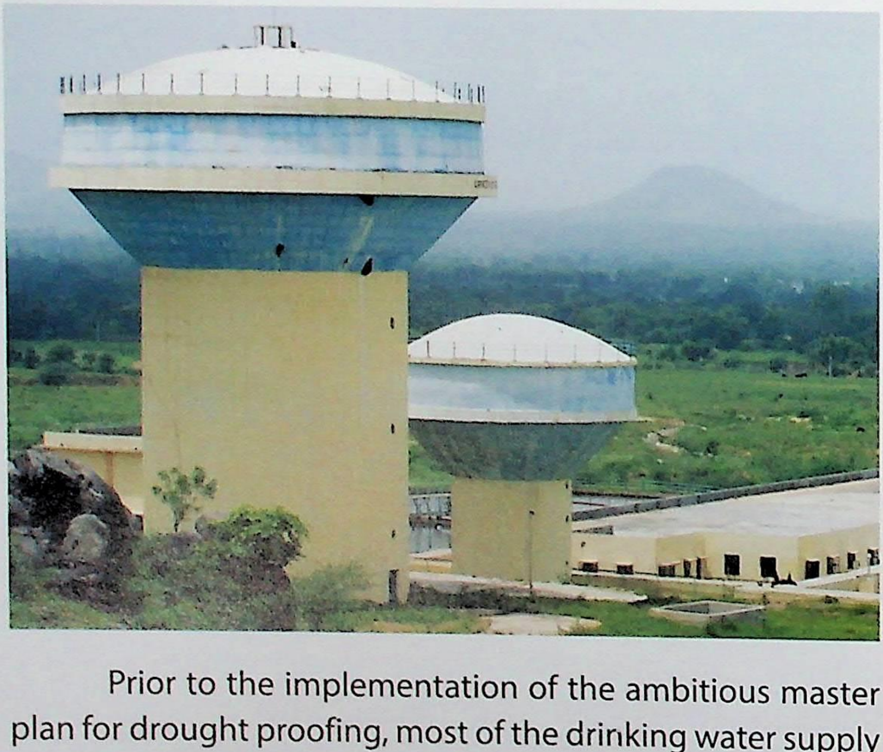


Permanent Disability by Skeletal Fluorosis

After taking over the reins of Gujarat, dealing with water stress and water insecurity was a big challenge for me. We drew up an ambitious strategy for creating a 'State Wide Drinking Water Grid' for bulk water transmission from sustainable surface water resources to water scarce and poor water quality habitations.

Large scale infrastructure has been created for this purpose, which includes 2,678 km of bulk pipelines and more than 120,769 km of distribution pipelines. About 11,950 hydraulic structures like elevated storage reservoirs with a total capacity of 1,268 million litres; 11,743 storage sumps; and high ground level reservoirs with a capacity of 2,675.10 million litres have also been constructed in the State. Along with this, 181 water filtration and treatment plants having a total capacity of 2,900 million litres per day (MLD) have been constructed. This treated water is delivered to more than 11,099 villages and 171 towns in the State for ensuring safe and assured water supply to about 68-70 % of State's population in drought prone and water quality affected areas through the Water Supply Grid.

All these efforts have resulted into considerable relief from the problem of excessive fluoride contamination. As per a recent survey in 2014, only 62 habitations have been found to be affected and the range of fluoride content has also shrunk considerably.



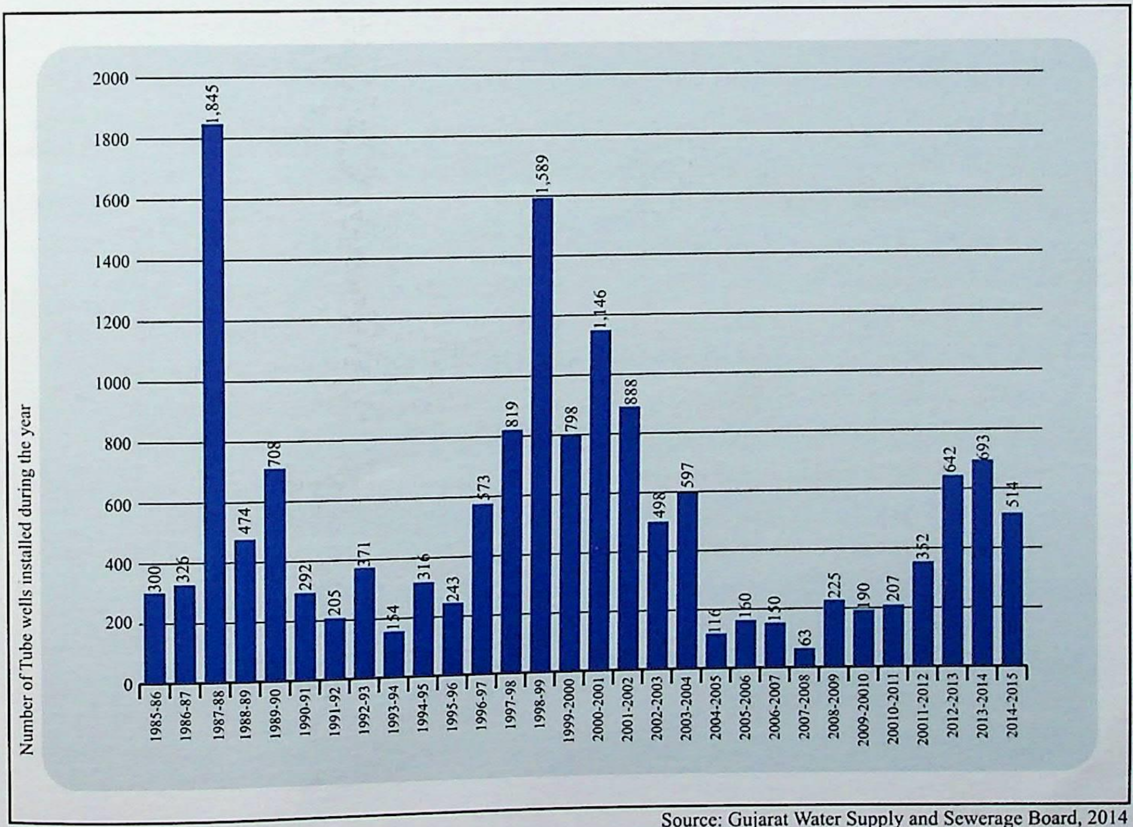
Water Treatment Plant and Elevated Storage Reservoir

Prior to the implementation of the ambitious master plan for drought proofing, most of the drinking water supply was based on ground water for which deep tubewells with high capacity pumping machinery were being utilised in the State.

The tubewells in North Gujarat and Saurashtra regions in the State were tapping deeper and deeper aquifers resulting in very high electricity consumption. Therefore, a 'vicious circle' was operating in relation to water and energy with considerable environmental and health costs.

The surface based water supply through pipelines being operated by centralised hydraulic structures has resulted in significant reduction of use of tube wells in these regions for drinking water supply. The number of such tube wells from 1985-86 to 2013-14 is shown in the following figure.

Number Of Tubewells Installed



Source: Gujarat Water Supply and Sewerage Board, 2014

The water grid proved its efficacy successively in the rain deficient years 2012 and 2013 when it was estimated that ₹ 9,000 million would have been required only to run water tankers in the absence of water grid**.

Annual Expenditure on Tanker Supply from 1990 to 2014

Year	Villages	Cost (₹ in Million)*
1990-1991	896	23.40
1991-1992	1,943	92.90
1992-1993	700	14.00
1993-1994	1,803	83.00
1994-1995	724	24.96
1995-1996	1,619	96.03
1996-1997	1,642	123.95
1997-1998	1,447	62.19
1998-1999	1,215	41.02
1999-2000	2,987	346.20
2000-2001	4,054	436.94
2001-2002	2,959	348.11
2002-2003	3,961	475.36
Sub-Total		2,168.06
2003-2004	600	47.38
2004-2005	869	92.32
2005-2006	398	77.06
2006-2007	207	17.08
2007-2008	188	14.17
2008-2009	326	13.14
2009-2010	524	31.79
2010-2011	212	18.10
2011-2012	421	81.35**
2012-2013	854	327.30**
2013-2014	267	192.6**
Sub-Total		925.05
Total		**3,080.24**

Source: Gujarat Water Supply and Sewerage Board, 2014

***1 US$ ≅ ₹ 64.2**

Decentralised Community Managed Water Supply Programme

Water and Sanitation Management Organisation (WASMO)

The creation of Water and Sanitation Management Organisation (WASMO) was a paradigm shift in the role of governance from provider to facilitator by empowering village level institutions through extensive capacity building and pro-active facilitation. Since its inception, WASMO has been able to bring in effective citizens' engagement through its innovative governance model for facilitating the successful community led water supply programme throughout the State of Gujarat. Now more than 18,185 Village Water and Sanitation Committees have been formed in the State that are ready to take the responsibility of management of service delivery and water resources management at the decentralised level. More than 11,561 villages have already commissioned the infrastructure and water conservation projects in a demand driven mode. Another 10,870 villages are presently implementing the decentralised community managed rural water supply programme in their villages with a strong feeling of ownership.

WASMO's strength lies in its organisational professionalism, innovations in governance, and strong partnerships with about 12 civil society organisations. The rural community is the central focus of WASMO's decentralised approach. Its innovation has led to the scaling up of reform processes to cover the entire State. Its professionals have created an enabling environment, which has resulted in, the community being fully empowered to take ownership of their water service delivery wherein operation and maintenance is done through tariff mechanism devised by consensus in the village assembly. It has also been able to institutionalise the rural water quality monitoring and surveillance programme. Majority of villages are now able to monitor their water quality through field test kits provided to a group of 5 to 6 persons of village water quality team which is duly trained. WASMO was given Prime Minister's award for Excellence in Public Administration for the year 2006-07. WASMO's innovation by my government has emerged as a model for learning and exchange, influencing policy initiatives in the water sector at the country level. WASMO has also been given the United Nations Public Service Award in the category of fostering participation in policy-making decisions through innovative mechanisms.

WASMO's Outreach at a Glance

Decentralised Community Managed Water Supply Programme

No. of Village Water and Sanitation Committees (VWSCs) formed	18,185 (99% of total villages)
No. of projects commissioned by VWSCs	11,561
No. of projects under implementation	3,464
No. of villages having institutionalised tariff mechanisms	10,870
Total fund allocated to villages	₹ 12,380.64 million*
Community contribution toward capital cost received from villages	₹ 1,238.06 million*
No. of women headed VWSCs	2,610
Total number of women in VWSCs	74,114
No. of NGOs as partner Implementation Support Agencies (ISA)	12
No. of districts covered	All 33 Districts

User Level Water Quality Monitoring and Surveillance

Villages where awareness generation campaigns are taken up	18,478
Villages where water quality teams are formed	18,310
Water quality kits distribution to villages	27,216
Water quality kits distribution to Municipalities	159
No. of persons trained for Water Quality Monitoring and Surveillance	371,201
No. of bacteriological testing vials distributed	9,553,296
No. of villages from where Water Quality Surveillance results are retrieved from local teams	18,310
Sanitary surveys conducted	258,327
Mapping of drinking water sources (habitations)	32,923
Multi district assessment of water safety done with the help of UNICEF	14 districts

***1 US$ ≅ ₹ 64.2**

Source: Narmada, Water Resources, Water Supply and Kalpasar Department, 2014

In several villages, the bore wells are now utilised as a dual source and the operational hours have been reduced. Based on a random survey, it has been observed that significant saving has been achieved in electricity consumption that is now available for alternative uses proving to be an eco-friendly achievement. Solar pumps have also been commissioned in 420 villages in the State and about 415 more solar pumping systems will be installed in near future. In various parts of the State, including coastal and tribal areas, rooftop rain water harvesting structures have also been taken up in public buildings, schools and individual household level, which is also resulting in substantial electricity savings. Comprehensive energy audits for various group water supply schemes have also resulted in energy savings.

It is estimated that approximately 87.02 million KWh of electricity is being conserved per annum due to operationalisation of surface based water supply through the pipelines in the State. The above mentioned measures have resulted in saving of about 19,405 tCO_2 equivalent emissions per annum, conservatively calculated.

With a paradigm shift from dependence on drinking water supply by tankers, trains and deep bore wells to safe surface water, much of the fluoride affected habitations have been covered by piped water supply.

Emission Savings in Drinking Water Supply

Sr. No.	Particulars	Energy Saving MWh per Annum	Equivalent Carbon Dioxide Emission per annum in tonnes
1	Piped water supply to villages & towns	80,300.00	17,906.90
2	Savings due to energy audit	5,184.78	1,156.21
3	Solar based pumping systems	1,149.75	256.40
4	Rooftop rain water harvesting	386.74	86.24
	Total	**87,021.27**	**19,405.75**

Source: Gujarat Water Supply and Sewerage Board, 2014

Technological interventions like defluoridation through reverse osmosis have also been taken up in some villages. In the remaining villages safe water sources have been identified or created and are being used for drinking water purpose. Thus, a 'vicious circle' has been transformed into a 'virtuous cycle' with a win-win situation for water, energy, environment and health sectors and with considerable economic benefits. In short, this is our action oriented response to the existing and future water stress and insecurity due to Climate Change.

powergudas of gujarat

(small is beautiful)

Water Harvesting Structure
District Bhavnagar, Gujarat

In 2004, a small village known as 'Powerguda' in the southern Indian State of Andhra Pradesh shot to fame by selling carbon credits worth ₹ 32,000* (equivalent to having saved 147 tCO_2) by replacing diesel used in water pumping engines by bio fuel produced from *Pongamia pinnata,* a native tree species found in the local forest.

Year	Expenditure	Storage Capacity
2005-06	₹ 193,000*	8,450 m^3

*1 US$ ≅ ₹ 64.2

World Bank bought those Carbon Credits to neutralise the emissions from air travel and local transport of World Bank officials. A good practice indeed! But let me confess, I had no Powerguda in mind while exhorting my officials to join hands with people in parched lands of different parts of Gujarat in 2004 in order to create checkdams and village ponds. My sole motivation was to reduce the miseries of millions of small and marginal farmers due to the vagaries of nature and difficult terrains through rainwater harvesting by micro irrigation structures. Checkdams were designed to cope with the flow of water from rivulets and streams with a maximum height of 1.5 to 2.0 m with the storage varying from 0.015 MCM to 0.035 MCM.

Water Harvesting Structure
District Junagadh, Gujarat

Year	Expenditure	Storage Capacity
2004-05	₹ 128,000*	4,650 m^3

***1 US$ ≅ ₹ 64.2**

The Sardar Patel Participatory Water Conservation Project (SPPWCP) stipulated that checkdams, village tanks/ponds could be taken up for construction by a beneficiary group or any Non-Governmental Organization (NGO) with technical and financial assistance from the District Panchayat (local representative body). They were initially required to contribute 40% of the estimated costs (later reduced to 10%) and the rest was to be funded by the

Government depending upon the progress of the work. In 2007 they were also given the option of contributing their 10% share by way of physical labour and, therefore, increasing their sense of belonging to the project by 'the gospel of dirty hands'. Six prototype designs were circulated with a maximum cost of ₹ 1,000,000*.

Details of Standard Farm Pond Size

Sr. No.	Farm Pond Overall Area in m^2	Size of Farm Ponds (in m)			Storage Capacity in m^3	Average Expenditure ₹*
		Top	Bottom	Depth		
1.	324 (18x18)	18	14	3	776	23,280
2.	400 (20x20)	20	16	3	980	29,400
3.	529 (23x23)	23	19	3	1,331	39,930
4.	625 (25x25)	25	21	3	1,595	47,850
5.	900 (30x30)	30	22	3	2,060	60,600
6.	1600 (40x40)	40	32	3	3,920	117,600

Source: Gujarat Land Development Corporation, 2009

Details of Standard Village Pond Size

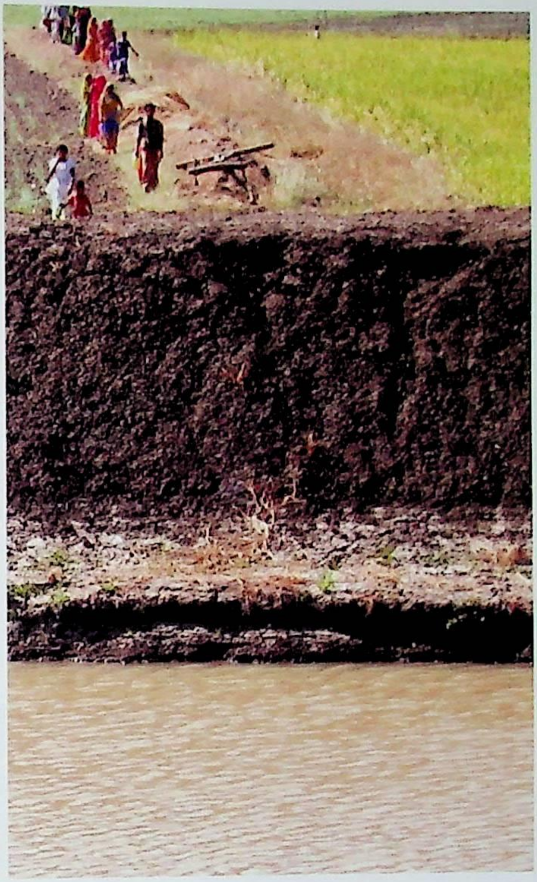
Sr. No.	Village Pond Overall Area in m^2	Size of Village Ponds (in m)			Storage Capacity in m^3	Average Expenditure ₹*
		Top	Bottom	Depth		
1.	3,600 (60x60)	60	56	2	6,736	202,080
2.	5,625 (75x75)	75	71	2	10,666	319,980
3.	10,000 (100x100)	100	96	2	19,216	576,480

Source: Gujarat Land Development Corporation, 2009

***1 US$ ≅ ₹ 64.2**

“— the localised rainwater harvesting systems in the form of checkdams contain a proven solution to water crisis by recharging priceless groundwater resources of Saurashtra installing a decentralised drought proofing system and involving people in critical water management tasks, with simple, local skill based, cost effective and environment friendly technologies.”

Source : Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, India



Public Participation in Micro Water Harvesting

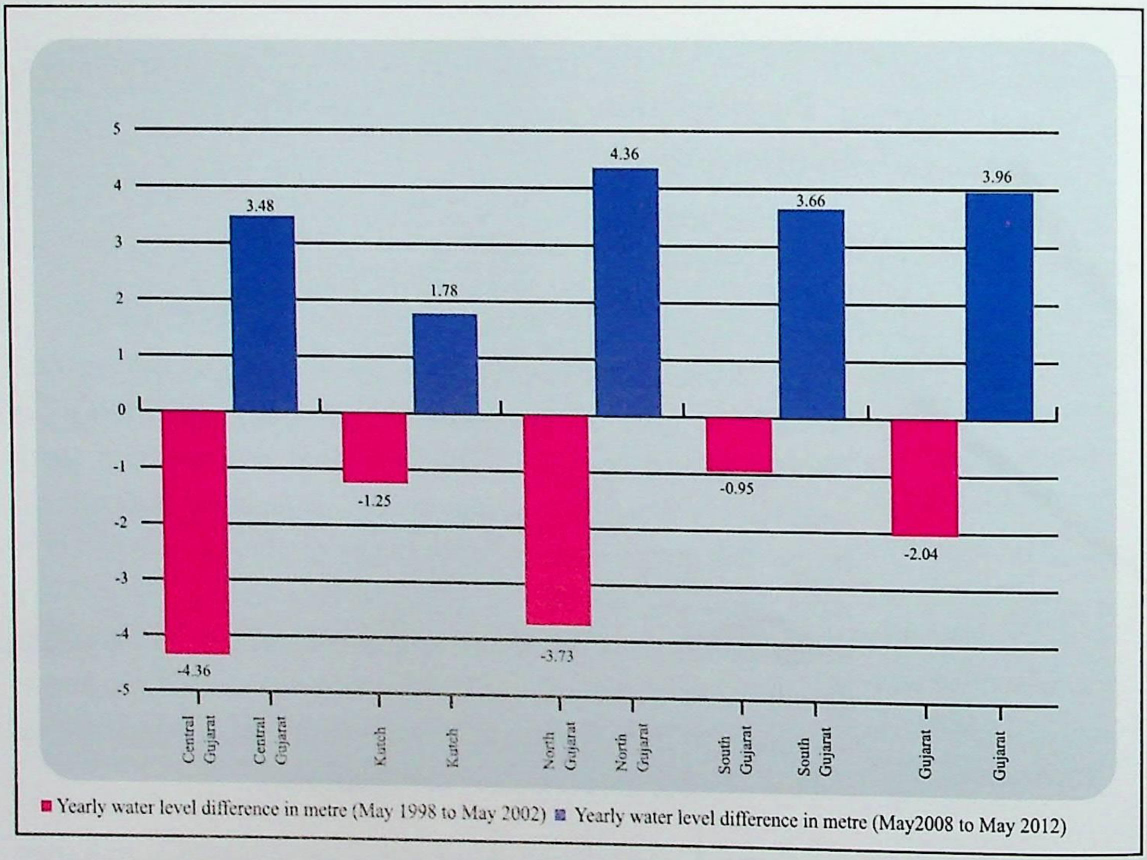
North Gujarat

However, the beneficiary groups were also given the latitude to take up the work as per their own design, if necessary and feasible. The technical scrutiny and work supervision would be done by the engineers of the local body. The entire responsibility of the quality of construction work, however, would rest with the beneficiary group/NGO under continuous guidance and technical inputs from the government technical staff. Maintenance works for these micro water harvesting structures would be carried out by the beneficiary group at their own expense.

A total of 353,937 checkdams and village ponds/tanks have been created in the State that provid direct benefit to over 13 million people in rural Gujarat.

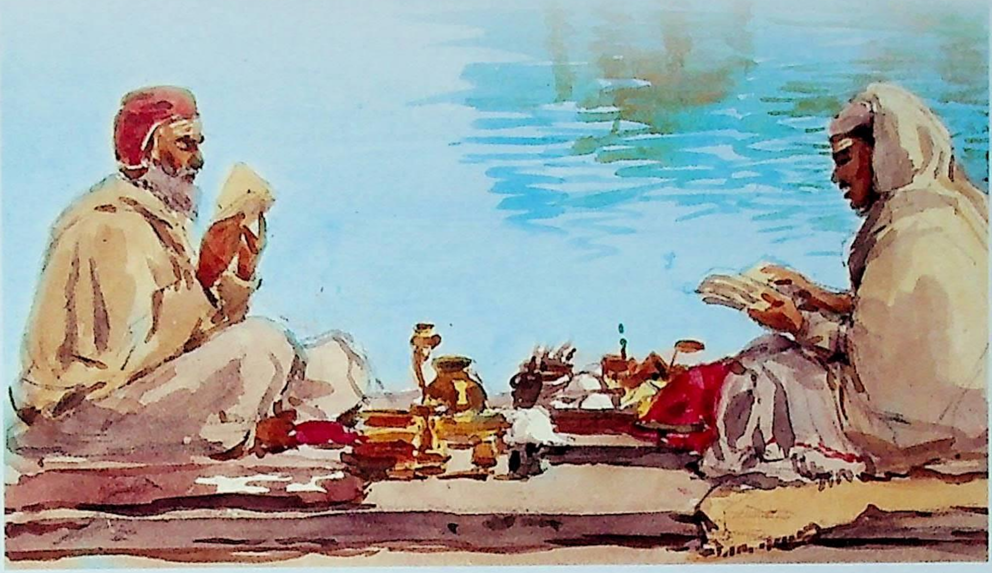
The average depletion of water levels in North Gujarat before the launch of this massive programme was around 3 m per year, which otherwise by now, would have cumulatively declined by almost 20-25 m – leading to sharp rise in electric consumption for drawl of ground water. But there has been a reported average water level rise of about 4 m during recent years as shown in the chart.

Ground Water Level Fall/ Rise (In Metres)



Source: Narmada, Water Resources, Water Supply and Kalpasar Department, 2014

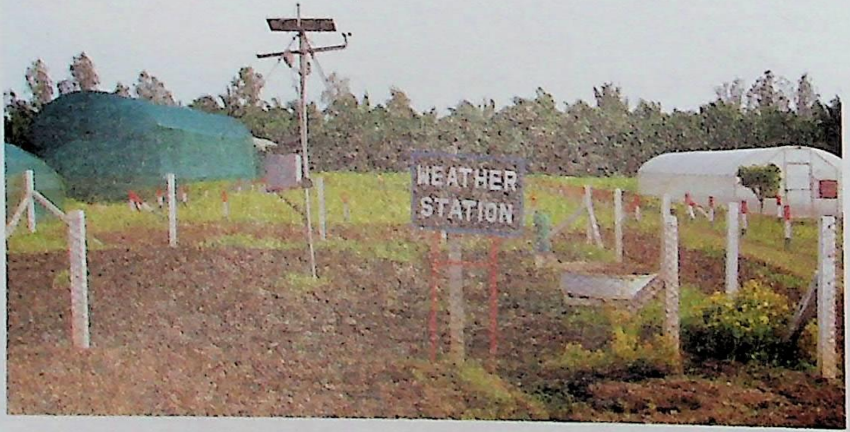
Jal Mandir



During my various interactions with small and marginal farmers in the State, I have been using socio-religious analogies for inculcating upon them the culture of water conservation. Social ethos in rural areas is more prone to be pro-actively driven for a particular cause by invoking religious beliefs and, therefore, I have been encouraging these farmers to make 'Water Temples' (Jal Mandir) by digging farm ponds and village ponds. This religious similie of equating water ponds with temples has lent religious reverence for the preservation and conservation of water through these ponds. I have also been telling farmers that however poor household theirs may be, they must be keeping an earthen pot full of water for drinking purpose. Similarly village and farm ponds are like water pots for mother earth for quenching her thirst. And farmers are duty bound to create them as an obligation towards mother earth. This has further enhanced, through belief system, the creation of micro water harvesting structures in different parts of Gujarat.

In the past we used to have step wells as an innovative mechanism of preventing evaporation and conserving water. These step-wells used to have stone carvings based on religious themes to invoke reverence and sentiments for water conservation.

On a macro level, irrigation efficiency has been improved and transmission and evaporation losses have reduced. Around 357,000 ha. of land has been covered under Participatory Irrigation Management leading to yield increase and water, fertiliser, labour and energy savings. It has been estimated that around 74.1 million kWh energy has been saved in just one year due to the adoption of drip irrigation by Gujarat Green Revolution Company – a body specially created for the purpose. Myriads of micro water harvesting structures dotting the landscape of Gujarat have led to the reduction in soil moisture evaporation in the surrounding agricultural fields and have facilitated the creation of orchards in places which barely used to produce single rain fed crops. Employment opportunities have been created for local residents, agricultural production has been enhanced, leading to rise in household incomes. The living standards and the average productivity of milch cattle has also gone up due to year-around availability of fodder. When I look back, I feel happy that we have created hundreds of thousands of Powergudas in Gujarat. If one Powerguda could save 147 tCO_2 emission, the cumulative achievement of these checkdams, farm and village tanks and ponds, etc., would definitely be millions of tCO_2 emission saving.



Agro Meteorological Unit
District Navsari, Gujarat

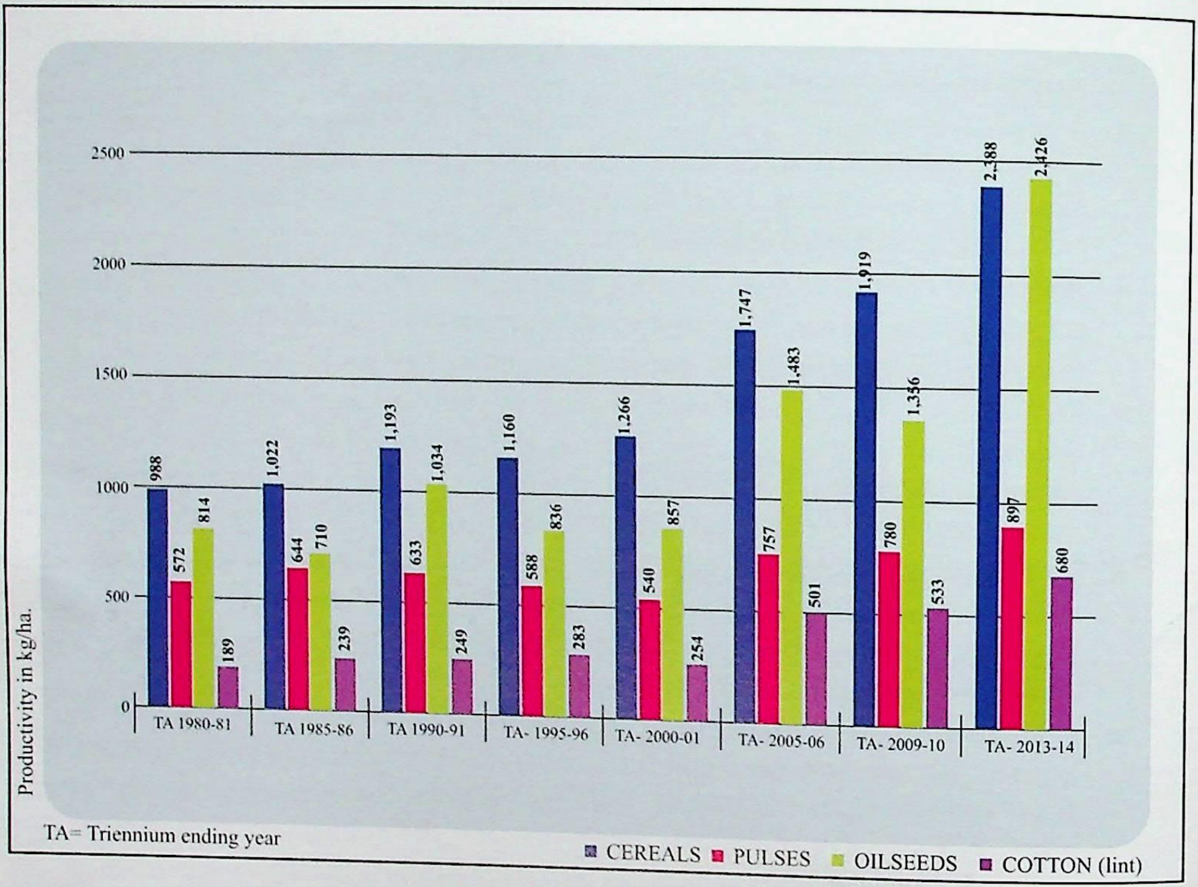
Agriculture and Climate Change

Apart from creating hundreds of thousands of micro irrigation structures, we have adopted a consistent strategy to cope with Climate Change in different agro-climatic zones of Gujarat:

- In each agro-climatic zone, there is one Agro-meteorological field unit, which provides weather based agro-advisory services to the farmers of that zone. This has helped the farmers to adopt better management practices and also to take preventive measures against any adverse effects of weather.
- Agro-climate based crop planning initiated through the Soil Health Card programme of my Government, in which a cropping system has been suggested based on soil moisture availability index and has helped farmers to adopt better remunerative crops, thereby increasing their incomes.
- Agriculture Universities have initiated steps to create a network of observatories in Gujarat by installing automatic weather stations at different research locations in order to generate online weather information and to create a data bank on climate.
- Researches on the effects of Climate Change have been initiated on breeding of heat and photoperiod insensitive crop varieties and erection of poly houses to create controlled environment. This has increased the yield and reduced population dynamics of insects, pests, diseases, etc.
- We have established "Centre for Weather Forecasting and Climate Change" at Anand, "Centre for Environmental Studies" at Navsari and "Centre for Agro-advisory Services" at Junagadh. These centres are engaged in critical analysis of weather/climate parameters and their likely impacts on agricultural production.
- In addition to these, at Anand centre, two projects have been initiated in collaboration with SAC, ISRO, Ahmedabad and IIT Delhi, under which 40 Agricultural Weather Station (AWS) will be installed in Gujarat. These will provide better weather forecast at extended range or at seasonal scale and will be beneficial for climate risk management.

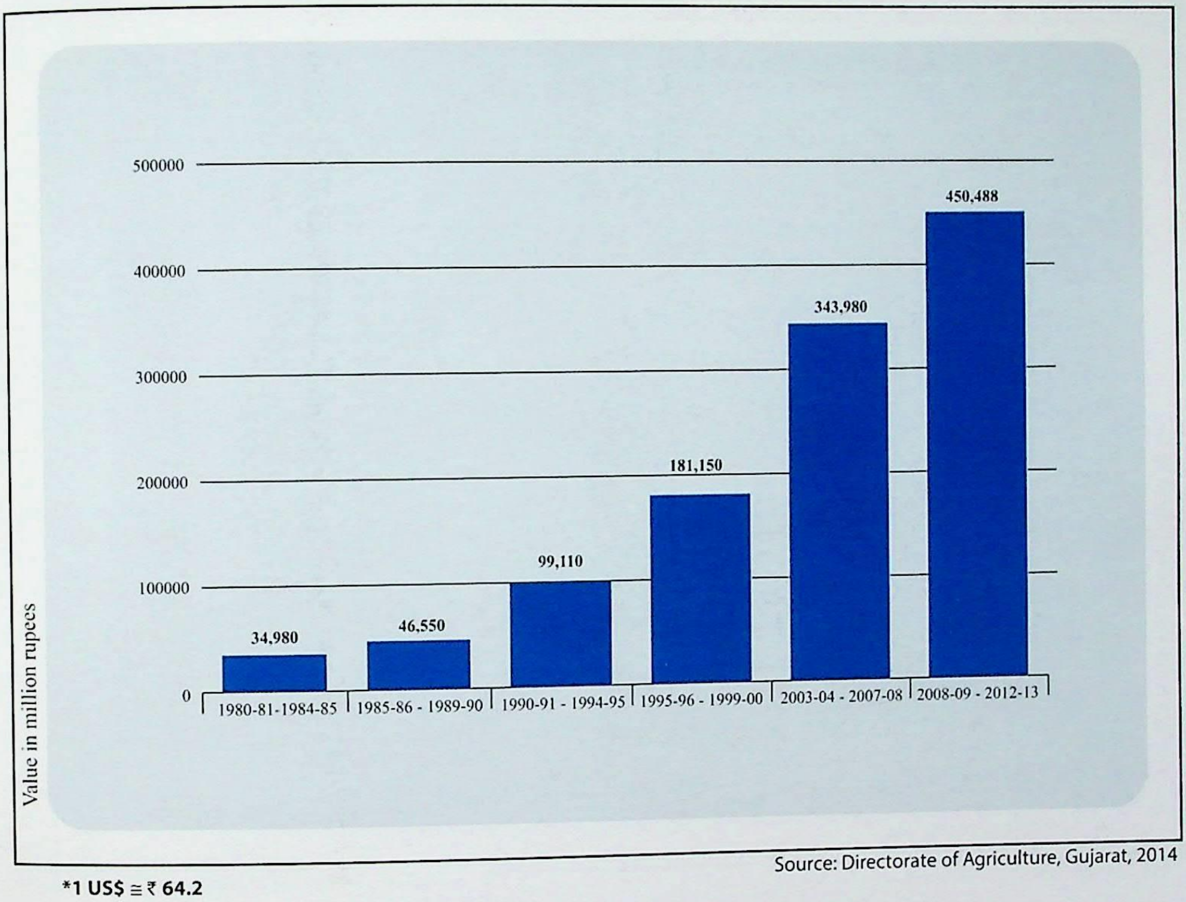
The cumulative effect of all this has been an increase in productivity of the major crops of the State, despite 0.1°C to 0.9°C average increase in temperatures recorded at various locations during the last couple of years. As compared to other States in India, Gujarat is an outstanding performer in agriculture, growing at the rate of 9.6% per annum. Though there is high volatility in agricultural growth rates for almost all States in India, performance of Gujarat's agriculture is more than thrice the all India figure. International Food Policy Research Institute, in a document of 2009, has specially commended Gujarat's recent growth in cotton, fruits and vegetables and wheat production.

Increase in Productivity of Crops in Gujarat (Average of Triennium)



Source: Directorate of Agriculture, Gujarat, 2014

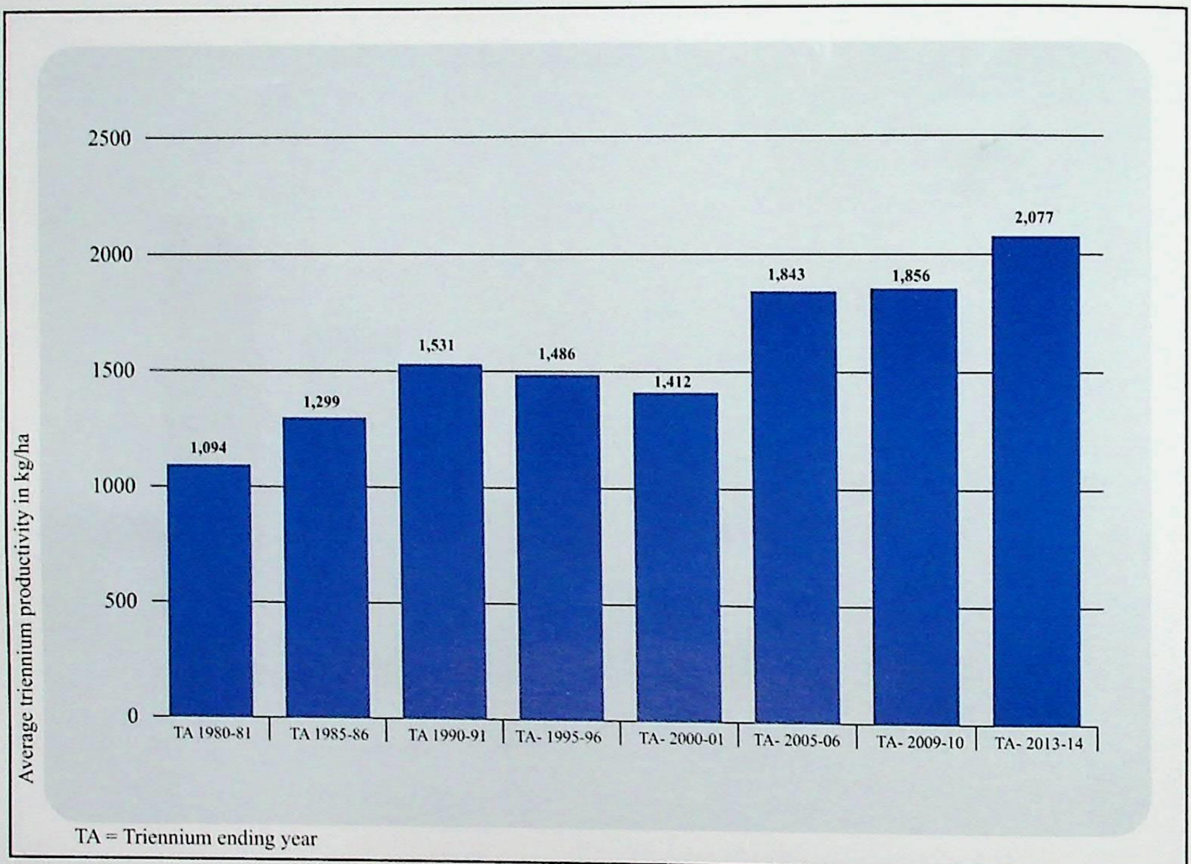
Increase in Farm Income in Gujarat (Agriculture GSDP at Current Prices)



Source: Directorate of Agriculture, Gujarat, 2014

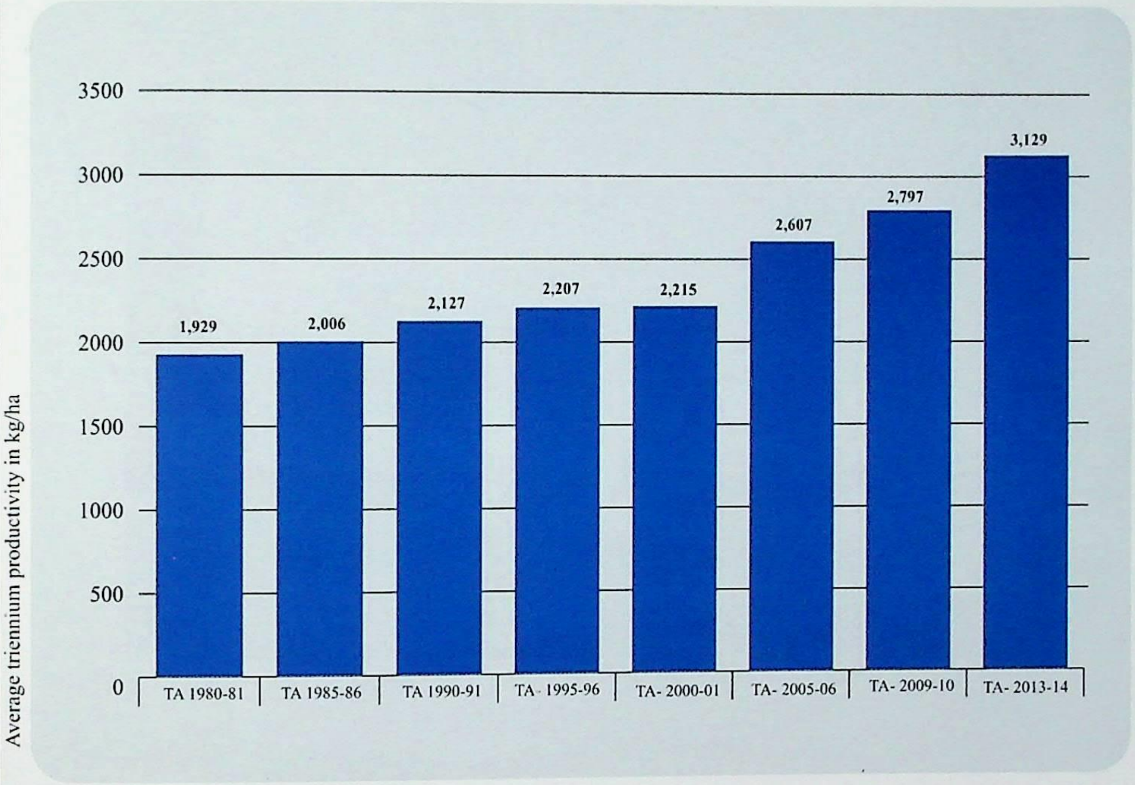
***1 US$ ≅ ₹ 64.2**

Increase in Productivity of Rice in Gujarat



Source: Directorate of Agriculture, Gujarat, 2014

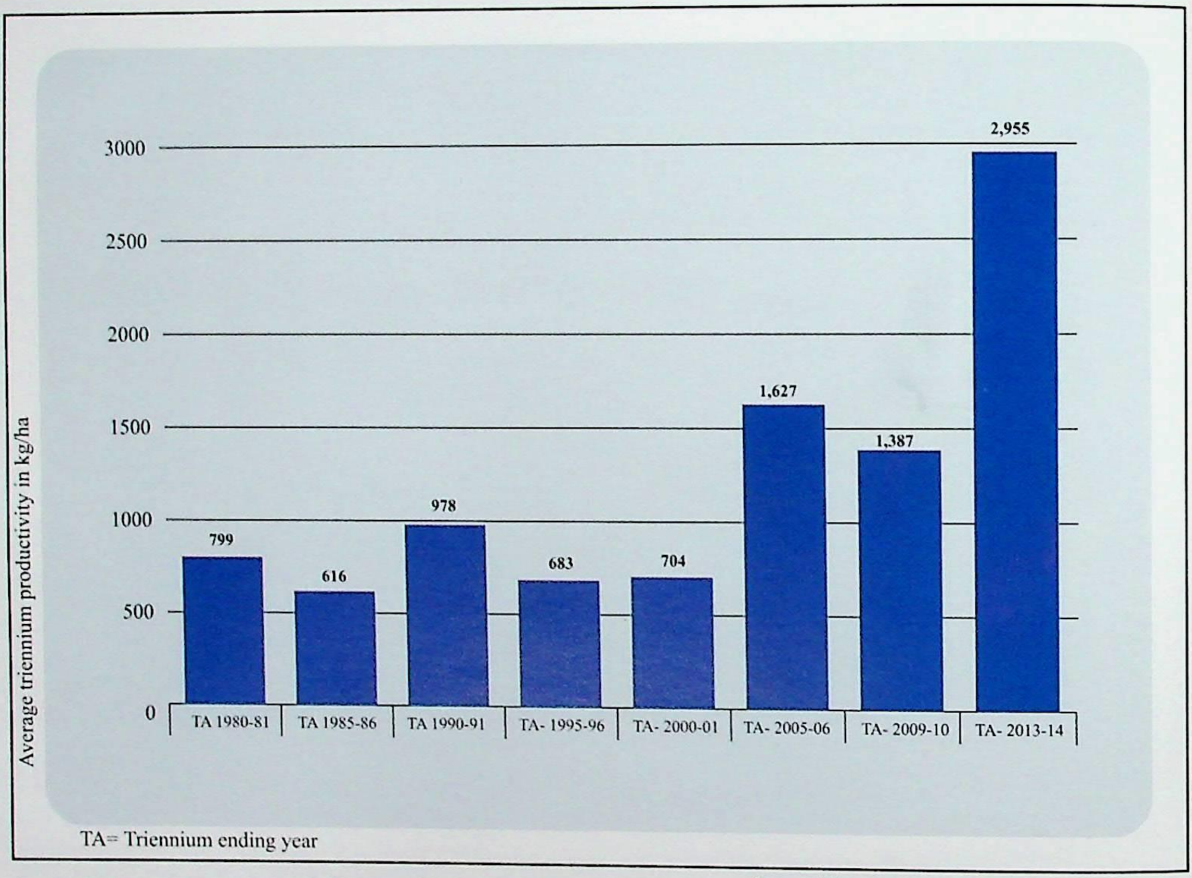
Increase In Productivity Of Wheat In Gujarat



TA= Triennium ending year

Source: Directorate of Agriculture, Gujarat, 2014

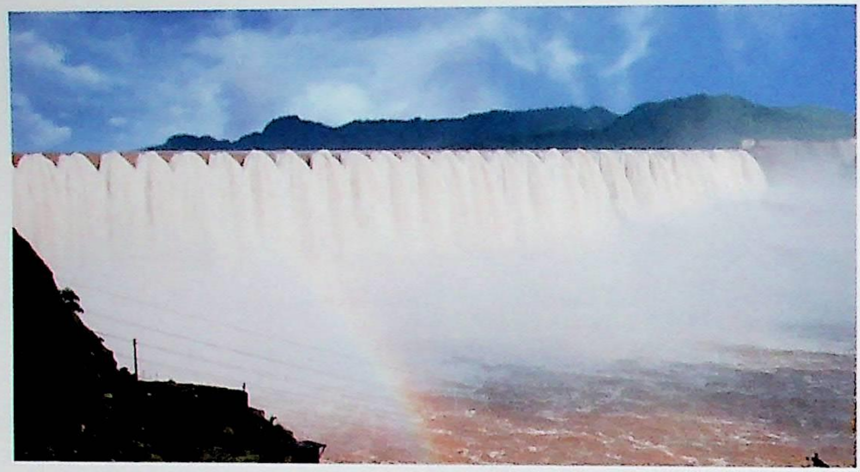
Increase in Productivity of Groundnut in Gujarat



Source: Directorate of Agriculture, Gujarat, 2014

big is also beautiful

(sardar sarovar project)



Overflowing Sardar Sarovar Dam

Sardar Sarovar Project of Gujarat is one of the most talked about large dam projects in the world in recent decades. Mired in controversies, political mismanagement and financial troubles, I inherited the project in an atmosphere of despair and hopelessness. Managing the rehabilitation in coordination with other neighbouring State Governments, satisfying the administrative and quasi-judicial mechanisms established by various judicial pronouncements and arranging for a high dose of finance on a continuous basis, was a task which consumed much of my attention during initial years.

With a concerted strategy and satisfactory compliance of the project obligations in terms of rehabilitation of project affected persons and environmental measures, we were able to ensure the raising of the dam height to 100 m in 2003, 110.64 m in 2004 and 121.92 m in 2006. This facilitated a much higher increase in storage of Narmada waters.

Dam Height and Storage Increase in Sardar Sarovar Project

Stage	2003	2004	2006	Ultimate
Height	100 m	110.64 m	121.92 m	138.68 m
Gross Storage	2,602.6 MCM (2.11 MAF)	3,700 MCM (3.00 MAF)	5,265.8 MCM (4.27 MAF)	9,460 MCM (7.7 MAF)
Live (Usable) Storage	-- --	-- --	1,565.8 MCM (1.27 MAF)	5,800 MCM (4.75 MAF)

Source: Sardar Sarovar Narmada Nigam Limited, 2014

Within a few days of formation of my government in Delhi, Narmada Control Authority in it 86th emergency meeting held on 12/06/2014 awarded permission to phase-1 construction of Sardar Sarovar Dam i.e. construction of piers, overhead bridge and installation of gates in open or raised position. The work started immediately and will be completed in 3 years. A deadlock continuing for years was successfully resolved in a few days.

Inter-basin Transfer of Narmada Water

Raising the dam height and the corresponding increase in the storage capacity have significantly improved the water supply and hydropower generation. The real benefits of the project which were awaited for almost 15 years have now started flowing. Diversion of Narmada waters to the main canal of the project (world's largest lined irrigation canal) was just 705 MCM in the year 2001, but it spectacularly increased to 5,195 MCM in 2003 and to 6,194 MCM in 2004. Although we deliberately decreased the water flow in subsequent years due to consecutive good monsoons, it remained to the extent of 4,201 MCM in 2005, 4,292 MCM in 2008, and 5,870 MCM in 2009. We also completed the construction of the main canal in the year 2008 and started water supply to our neighbouring State - Rajasthan - in March 2008, fulfilling the real objective of this project as an Inter-State River Project. And in the year 2013-14, the flow was increased to 9,427 MCM.

Not only this, with the command area being covered to the extent of around 600,000 ha., we have significantly interlinked many rivers by the interbasin transfer of Narmada waters using the Sardar Sarovar Canal Network.

Narmada water has been released in the dry beds of Heran, Orsang, Karad, Dhadhar, Mahi, Saidak, Mohar, Shedhi, Watrak, Meshwo, Khari, Sabarmati, and Saraswati rivers. The ecology and water quality of these rivers have drastically improved over the last couple of years. In addition to minor rivers, around 893 village tanks have also been filled-up with Narmada water as part of drought management measures, which has substantially improved the water availability for irrigation purpose in these villages.

Another long pending issue was that of operationalising the 250 MW Canal Head Power House (for want of required water head in the reservoir). We operationalised this power house in August, 2004, and thereafter a river bed power house of 1,200 MW capacity was also put into operation in a phased manner starting from February, 2005 to June, 2006.

The hydropower generation that commenced in Sardar Sarovar Project since August 2004, resulted in generation of 32,593 million KWh of electricity till March, 2014.

Impact of Narmada Water on Quality of Other River Waters (Annual Average)

Name of River	Place of Measurement	Index for water quality							
		pH		Dissolved Oxygen		Bio Chemical Oxygen Demand		Chemical Oxygen Demand	
		2002-03	2013-14	2002-03	2013-14	2002-03	2013-14	2002-03	2013-14
Sabarmati	Vasna-Narol Bridge	6.2 to 8.5	7.93	1.13	5.6	78	15.3	214	58
	Railway Bridge Ahmedabad	6.9 to 8.4	7.83	4.12	5.9	22	4.4	72	16
Shedhi	Kheda	7.3 to 8.2	7.65	8.36	5.91	9	5.34	38	18.86
Mahi	Vasad	7.6 to 8.8	8.32	5.73	8.08	4	4.03	--	13.55
Dhadhar	Kothvada	7.81	--	0.6	--	41	--	--	--

Except pH all the parameters are in mg/l

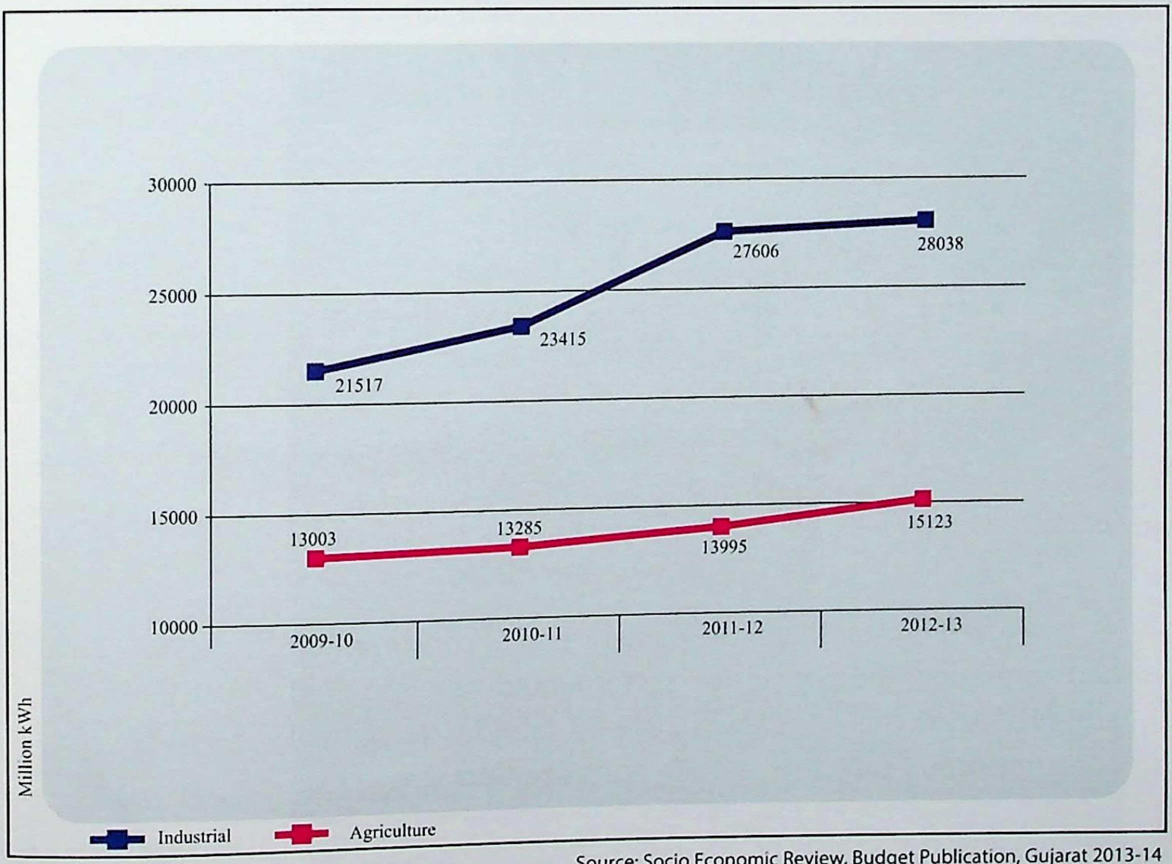
Source: Gujarat Pollution Control Board Annual Report, 2013-14

Environment- Sardar Sarovar Project

- Catchment Area Treatment in 27,204 ha. in forest area and 1,953 ha. in non-forest area.
- Compensatory afforestation in 4,650 ha. of non- forest area and 9,300 ha. in forest area.
- Dam vicinity area plantation-550 ha.
- Canal side plantation-4,702 ha.
- Satellite imageries of the year 2012 reveal increase of 21.32 % in dense forest, 3.70 % increase in open forest and reduction of degraded forests by 26.13 % as compared to the year 1986.
- Mangrove plantation in 110 ha area in the downstream of the dam.
- Gully plugging 1,156,773 m^3, Brushwood plugging in 34,491 m^3, Contour Dyke in 17,437 m^3.
- 131 Permanent Check dams, 436 Temporary Checkdams and 21 Checkwalls.

I find the inter-linkages between water and energy very fascinating in the case of Sardar Sarovar Project. The wide availability of Narmada water from Sardar Sarovar has led to intangible benefits in terms of virtual savings of electricity that would otherwise have been consumed to draw this amount of water from ground water resources. This has further led to virtual savings of water that would have been consumed in generation of this electricity through Thermal Power Generation. The recorded pattern of electricity consumption in Gujarat, in the year 2000-01, showed that the agricultural sector consumed the highest share at 45.12% whereas the industrial sector ranked second with 28.59% consumption. But the situation changed by the year 2012-13 due to concurrent emphasis that we gave to Sardar Sarovar Project as well as Micro Water Harvesting Sector. Therefore, this consumption of electricity by agricultural sector drastically reduced to 22.25% leaving scope for enhanced consumption by industries. With this, their share in consumption increased to around 41.75% in the year 2012-13.

Consumption Pattern of Electricity in Gujarat State



Source: Socio Economic Review, Budget Publication, Gujarat 2013-14

Eco-friendly Power from Sardar Sarovar Project

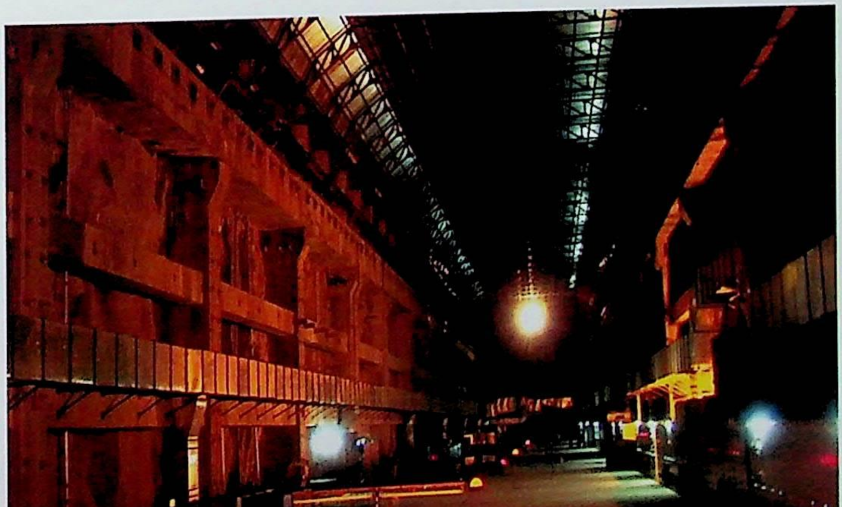
Year	Generation of Electricity (Million kWh)	Year	Generation of Electricity (Million kWh)
2004-05	263.257	2009-10	2,501.327
2005-06	1,951.782	2010-11	3,588.740
2006-07	3,600.082	2011-12	4,359.296
2007-08	4,435.692	2012-13	3,698.239
2008-09	2,317.673	2013-14	5,877.324

Source: Sardar Sarovar Narmada Nigam Limited, 2014

Dedication Ceremony of 1450 MW
Sardar Sarovar (Narmada) Hydro Electric Power Project

Now it is clear that if the earlier trend of consumption had continued, the agriculture sector would have required around 30,668 million kWh in 2012-13 (at 45.12% of total consumption). But the actual consumption had been brought down to 15,123 million kWh, which suggests a saving of about 15,545 million kWh per year. Technically this may be attributed to the combined effects of (a) no more need to pump groundwater in many areas and (b) lower pumping requirements due to recharge of aquifers (where pumping could not be avoided altogether). Such savings must have increased gradually over these years, the total of which could be assessed at 93,270 million kWh. Therefore, the total assessed benefits of electricity would aggregate to 125,863 (=32,593 + 93,270) million kWh.

Now extending this argument further, the generation of this much electricity by thermal mode would have further required 818.04 MCM of water. And to draw this water from groundwater resources would have further necessitated electricity consumption. Therefore, due to water and energy linkages, savings in one sector have led to savings in CO_2 emission to the extent of 28.403 million tonnes. What better example of emission reduction could there be?



Machine
Hall of
River Bed
Power House
(1200 MW)

Contribution of Sardar Sarovar Project in Reduction of GHG

Particulars	Generation / Savings in Electricity (Million kWh)	Equivalent Savings in Coal (Million Tonnes)	Equivalent Savings in CO_2 Emission (Million Tonnes)	Equivalent Suspended Particulate Matter (Tonnes)	Equivalent Sulphur Dioxide Emission (Metric Tonnes)
Hydropower at RBPH & CHPH	32,593.00 (till March, 2014)	22.82	7.276	356,503	837,623
Electricity saved due to water supply	93,270 (till March, 2014)	65.288	20.839	1,020,189	23,96,991
Electricity virtually saved by not fetching 818.04 MCM water for above power generation by thermal mode	1,307.29	0.915	0.288	14,300	33,598
Total	**127,170.29**	**89.023**	**28.403**	**13,90,992**	**32,68,212**

Note: RBPH- River Bed Power House;
CHPH: Canal Head Power House

Source: Sardar Sarovar Narmada Nigam Limited, 2014

silenced river springs back to life

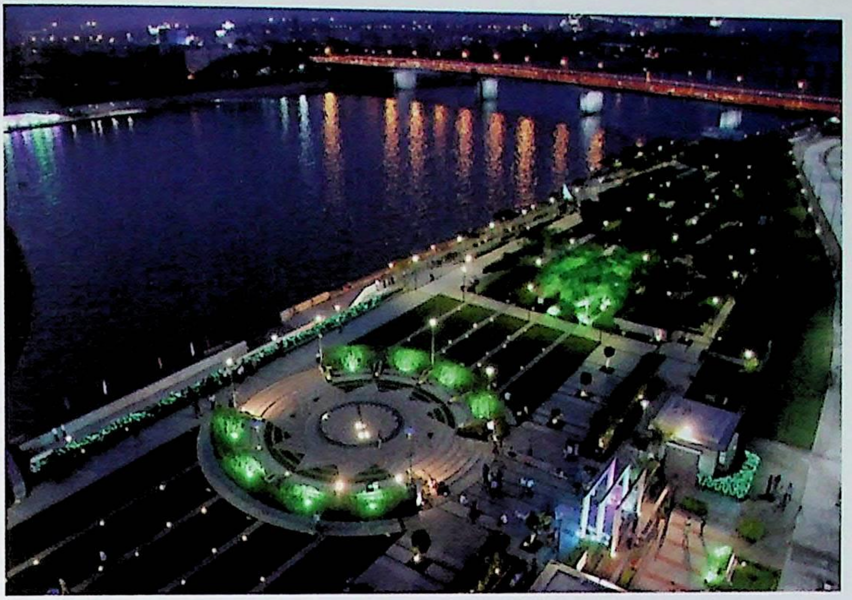
(reviving sabarmati
river by inter-basin
water transfer)

Sabarmati River Front Development Project

Ahmedabad, Gujarat

One day while passing through one of the bridges of Sabarmati River that connects eastern Ahmedabad with its ever expanding western side, I saw a few children playing cricket in the dry riverbed. A thought struck my mind with lightening speed. "Oh! this generation, if asked about Sabarmati River, will only term it as large play ground, completely unaware of the rich ecology and bustling water resources that it once possessed.

No! we should not deprive our children of the eternal happiness they would derive from flowing water and the adult denizens of the city of pleasure of living by the river side", I said unto myself. And then I realised that since long Sabarmati River has been subjected to severe pressure and abuse owing to fast pace of urban and industrial growth of city of Ahmedabad with over four million inhabitants. On the other hand, in absence of regular releases of water from Dharoi dam in upstream, this river practically remained without any source of water. Due to this, for years, the river banks remained neglected and characterized by unimaginative and unplanned development.



Appealing Riverfront for All

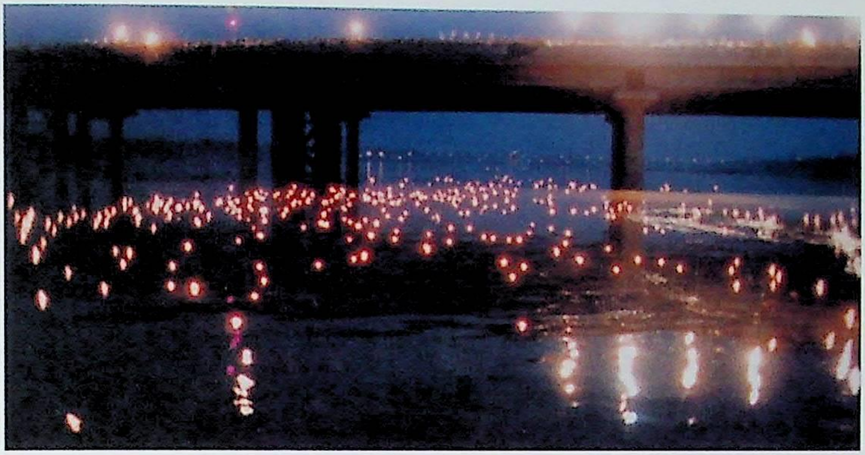
Its banks and bed remaining dry most of the time, provided a place to stay and source of livelihood for many poor citizens. These river bank slums had been disastrously flood prone and lacked basic infrastructure services. The slums located along the river bed had always been a major impediment to efficient management of monsoon floods in the river.

Sewage contaminated the storm water outfalls and the dumping of industrial waste posed a major health and environmental hazard. The river water samples taken in November 2003 showed a high level of Bio Oxygen Demand, Chemical Oxygen Demand, Chlorides, Sulphates, Total Dissolved Solids, Suspended Solids, Fecal Coliform and very less Dissolved Oxygen, all of which cause water-borne diseases and have an adverse impact on aquatic life.

"How to bring life back to this historical river?", I asked myself. I knew that there was no other perennial and dependable source of water which could turn this river back to flowing state except Narmada water. Fortunately, the Narmada main canal was ready to transfer the Narmada water to the river Sabarmati after travelling a distance of 230 km. With the Narmada main canal duly completed to bring water to this point and with the already provided escape structure, it was an ideal arrangement to operationalise the inter-basin transfer of Narmada water, I thought.

Inter-basin Transfer of Narmada Waters Into Sabarmati

On the Narmada Main Canal, an escape structure with discharge carrying capacity of 450 m^3 per second (15,890 cubic feet per second) was constructed during 1998-2001, which cost ₹ 60 million*. The primary objective of this escape structure was to safely release the canal water to Sabarmati river in the event of any sort of mismatch between the demand and supply which could cause a potential threat to the safety of the canal. However, its potential to bring about inter-basin transfer of Narmada water was untapped, for the



Illumination Signifying Revival of Sabarmati

simple reason that the constructed dam height and created storage potential in Sardar Sarovar were not conducive to such a large-scale diversion of water. With the stage-wise increase in the Sardar Sarovar dam height and associated enhancement in available storage, this escape structure became a perennial source of water for Sabarmati river. This not only quenched the thirst of the city of Ahmedabad, by effective utilisation of surplus water from Narmada, but even the French Wells in the riverbed got rejuvenated. With three radial gates of the size 7.0 m x 8.3 m, it was now possible to release regulated discharge in the dry riverbed of Sabarmati and thus the dream of many to see the Sabarmati river in spate finally came true. During last three years, on an average, 600 to 1,200 MCM of water was released every year in the dry bed of river Sabarmati, which gets stored in a stretch of 11.5 km – right upto Vasna Barrage.

Recreational Spot for People

Having ensured that round the year inter-basin transfer of Narmada water will make the river Sabarmati independent of the vagaries of nature during monsoon, I decided that appropriate development of the riverfront could turn the river into a major asset, which would improve the quality of environment and life in Ahmedabad, improve the efficiency of its infrastructure, conserve the places of heritage importance, and create an opportunity for recreation and hospitality industry. However, as usual my direct intervention was required to cut through the bureaucratic web for transfer of the 204.91 ha land to Ahmedabad Municipal Corporation for the execution of River Front Project by Sabarmati River Front Development Corporation Limited (SRFDCL). And thereafter, the project took off without delay.

Sabarmati River Front : A Perennial Water Body

- This ambitious project has created embankments protected by RCC retaining wall, supported by RCC Diaphragm wall for scour protection and developed an 11.5 km stretch of the river along each of the banks from upstream of Subhash Bridge to Vasna Barrage. This Stretch has become a perennial water body having storage of about 12.5 million CMT.

- In this project, separate interceptor line with sewage diversion system is laid on both sides of the river for disposal of mixed sewage which is diverting about 225 MLD sewage, this has resulted in a better quality of water and aquatic life.

- The project is providing protection against 475,000 cusec flood and also preventing the scouring of the project area.

- The project has rehabilitated 10,000 families, 200 washer men and 1200 vendors with better facilities.

- Due to heavy drawl of ground water during past many years, there had been a depletion of ground water table by 2.0 m annually. But implementation of Sabarmati River Front Develoment (SRFD) Project has resulted in recharging of ground water aquifer.

- 204.91 ha of land is available and getting utilized for green environment development, which would reduce greenhouse gas emission.

- Plantation of more than 30,000 trees along with development of various Gardens, Parks, and Biodiversity Park etc. as Green Area would enhance the Green environment of the city along with walkways and road network on both the sides.

- A well planned Event Centre for public and private events has been developed on the bank of the river and recreational facilities like Boating, Zip line, Segway, Golf - cart rides etc.

Land use in River Front Development Project

Description	(Ha.)	%
Roads	40.36	19.69
Residential Zone -I (Residual)	0.8	0.39
Central Business Dist.-CBD (Residual)	5.67	2.77
Multi Use (land for sale)	29.71	14.5
General Industrial Zone (Residual)	0.09	0.04
Garden	27.46	13.4
Open Space	37.66	18.38
Public Purpose	28.18	13.75
Public Utilities	0.84	0.41
Lower Promenade	27.39	13.37
Sports Purpose	6.74	3.29
Burial Ground (Residual)	0.01	0.01
Total	**204.91**	**100**

Source: Sabarmati River Front Development Corporation Limited, 2014

in search of better alternatives

(panam high level canal project)

Panam Dam
District
Panchmahals,
Gujarat

During the last couple of years I have consciously tried to ensure that in water resources development more environment friendly solutions with lesser carbon footprints are preferred over the ones that are more technology driven, with higher carbon footprints. A very interesting example is the Panam High Level Canal Project executed in Gujarat when I was the Chief Minister.

Panam dam was constructed across Panam river in Central Gujarat (Panchmahals District) in 1978, with irrigation command area covering more than 130 villages (36,405 ha) and also providing drinking water to around 330,000 people. It has a small canal based hydro power station of 2 MW capacity.

Effectively, the requirement of around 200,000 people is fulfilled by this multipurpose project. However, since its inception the project suffered from one major deficiency – Panam main canal, a 100 km long contour canal, served only the command area that fell to its right side while the farmers on the higher grounds of this command area were deprived of irrigation due to difficult and inconvenient topography.

During one of my visits to the area, a few years back, there were strong representations of these farmers who expressed their concerns. Ever since then, I had been weighing the various alternatives that were brought before me as solutions.

Panchmahals District comprises of geological terrain of Aravali hills and along the alignment of the high level main canal there sits a big hillock which forms the main barrier to the increase in command area.

The first alternative was to dig an open canal (channel) with around 60 m depth and with an average cutting of 36 m, at a cost of ₹ 1,500 million.* This would have also necessitated acquisition of around 35 ha of private and reserved forest lands, felling of 39,000 trees and displacement of 22 families.

The channel cutting of around 4.8 million m^3 would have necessitated consumption of 3.23 million litres of fossil fuel (diesel) etc., for excavators and other machineries.

3.3 km Long Tunnel - Panam High Level Canal Project

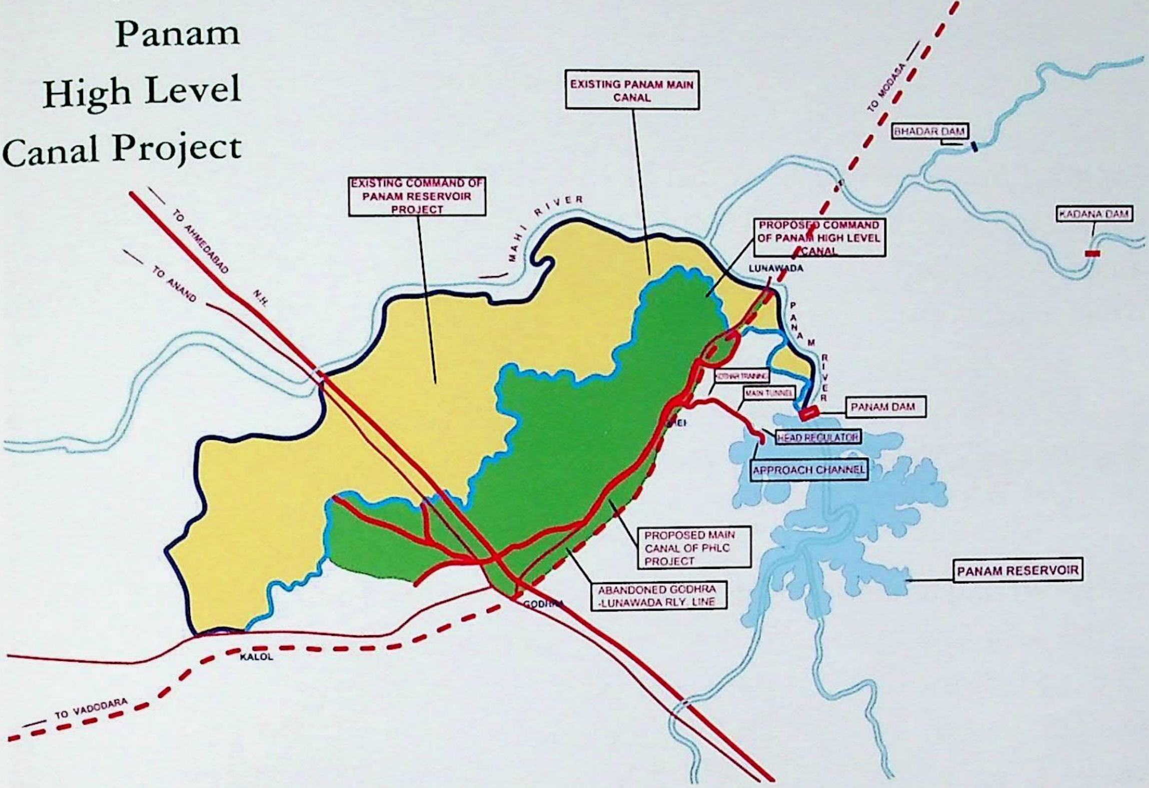
* Actual cost 1 US $ ≅ ₹64.2

The second alternative was lifting water from the reservoir through pumping by laying down pipelines and constructing pumping stations at a cost of ₹1,300 million*. For irrigating 18,000 ha we would have required lifting 800 cusecs water at 55 m height for 80 days. This would have amounted to the use of 2,000 MW power which in turn would have led to additional emission of 3.57 million tCO_2 every year.

Considering very high carbon footprints, human displacement and direct loss of forest lands, I decided not to go in for these alternatives. Instead, I chose to get an irrigation tunnel constructed at a cost of around ₹644.10 million*. This water carrying tunnel is the first of its kind in Gujarat and one of the very few existing in the country. With a length of 3,362 m, 6.60 m bed width and 6.60 m height, it has 800 cubic feet per second discharge capacity. By making this tunnel, we would provide irrigation to 18,000 ha. of land benefitting around 125,000 people at no extra submergence and no displacement of persons. We would also be utilizing only the surplus water from the existing reservoir. As an additional advantage, the nearby wells, around 60 village tanks and 500 check dams are being interlinked for recharge with the canal work, providing irrigation in an additional area of 2,000 ha. It has been a win-win situation since surplus water in the existing reservoir has been diverted at minimum environmental and human costs. I treat this as a positive step in my search of better alternatives for development of Gujarat.

***1 US$ ≅ ₹ 64.2**

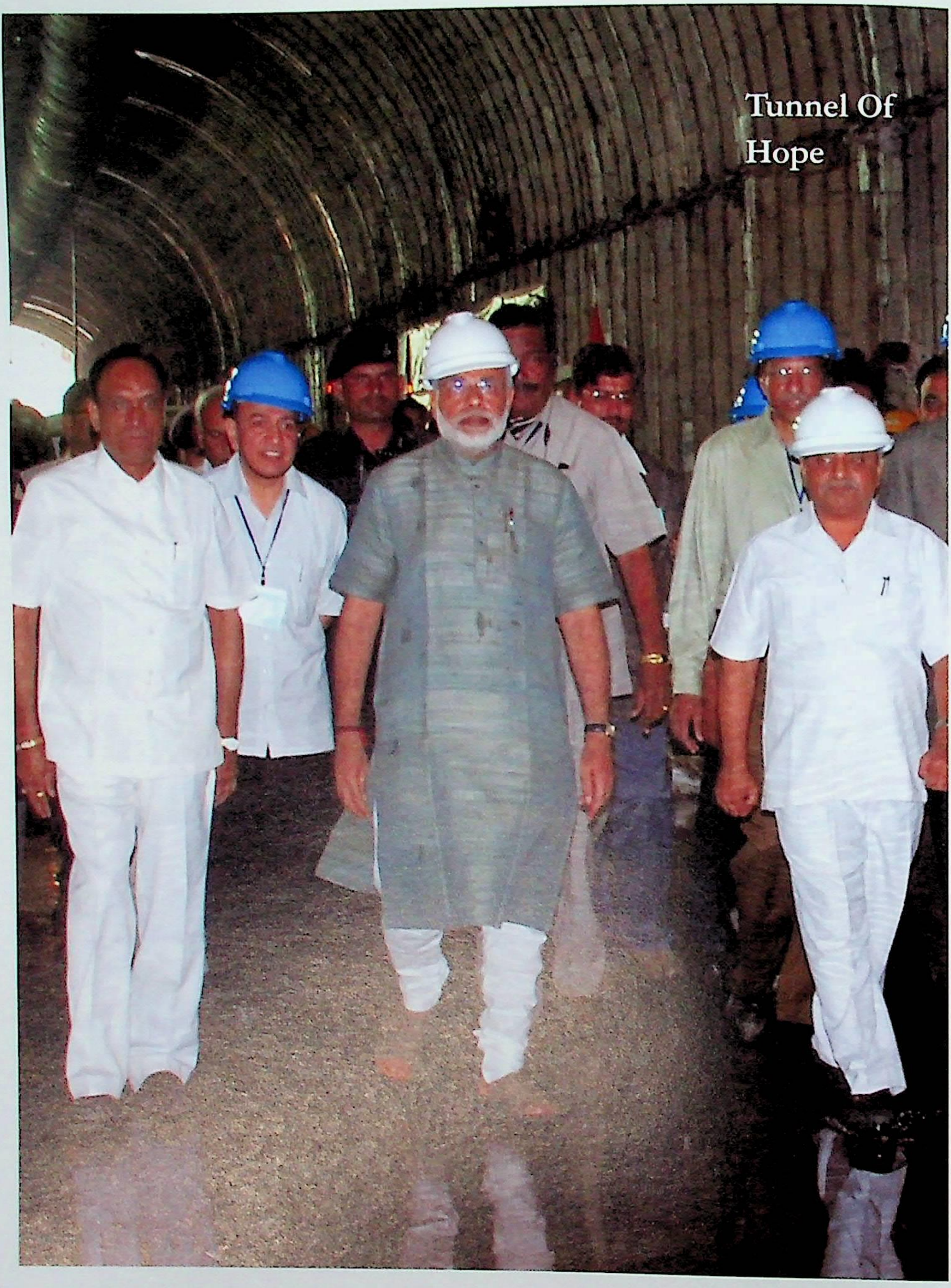
Layout of Panam High Level Canal Project


EXISTING PANAM MAIN CANAL
EXISTING COMMAND OF PANAM RESERVOIR PROJECT
TO MODASA
BHADAR DAM
KADANA DAM
MAHI RIVER
PROPOSED COMMAND OF PANAM HIGH LEVEL CANAL
LUNAWADA
PANAM RIVER
TO AHMEDABAD
N.H.
TO ANAND
MAIN TUNNEL
PANAM DAM
HEAD REGULATOR
APPROACH CHANNEL
PROPOSED MAIN CANAL OF PHLC PROJECT
ABANDONED GODHRA -LUNAWADA RLY. LINE
PANAM RESERVOIR
GODHRA
KALOL
TO VADODARA

LEGEND

N

1.	KADANA DAM SITE	
2.	PANAM DAM SITE	
3.	BHADAR DAM SITE	
4.	EXISTING PANAM MAIN CANAL	
9.	COMMAND OF EXISTING PANAM MAIN CANAL	🟨
5.	PANAM SUBMERGENCE AREA	
6.	PANAM HIGH LEVEL CANAL (LEFT AND RIGHT BRANCH)	
7.	NATIONAL/STATE HIGHWAY ROAD	- - -
8.	RAILWAYS	
9.	COMMAND OF PANAM HIGH LEVEL CANAL	🟩


Tunnel Of Hope

नाना जी देशमुख पुस्तकालय
क्रमांक 383

Panam High Level Canal - Alternatives Considered

36 m Deep Open Canal

Canal section having 6.6 m bed width and 3 m berm on both sides at 6 m interval and inside slope of 1:1 in 6 m soil portion and 0.5:1 in rest of soft/hard rock strata is considered as an average section for 36 m deep canal.

Excavation Quantity = 4.80 million m^3

Considering one excavator with hauling equipments consuming 14 litre diesel per hour and having output of 500 m^3 per day.

Diesel required per 1 m^3 excavation

= (14 x 24) / 500

= 0.672 litre

Total diesel required in this case

= 4.8 million m^3 x 0.672 litre per m^3

= 3.23 million litres

55 m Lift From Reservoir

Quantity of water required for

18,000 ha = 150 MCM
= 5,580 Mcft
= 5,580 x 11.574 day cusecs
= 64,583 day cusecs

No. of days of Pumping

64,583 day cusecs to be lifted at the rate of 800 cusecs per day i.e. 64,583 / 800
= 80 days

Electricity Requirement

1cusecs for 33 m lift need 24.24 HP
So that 64,583 day cusecs lifting for
55 m need = 2,609,153 HP
= 1,946,428 kW

Total power required to lift 800 cusecs
for 80 days = 2,000 MW

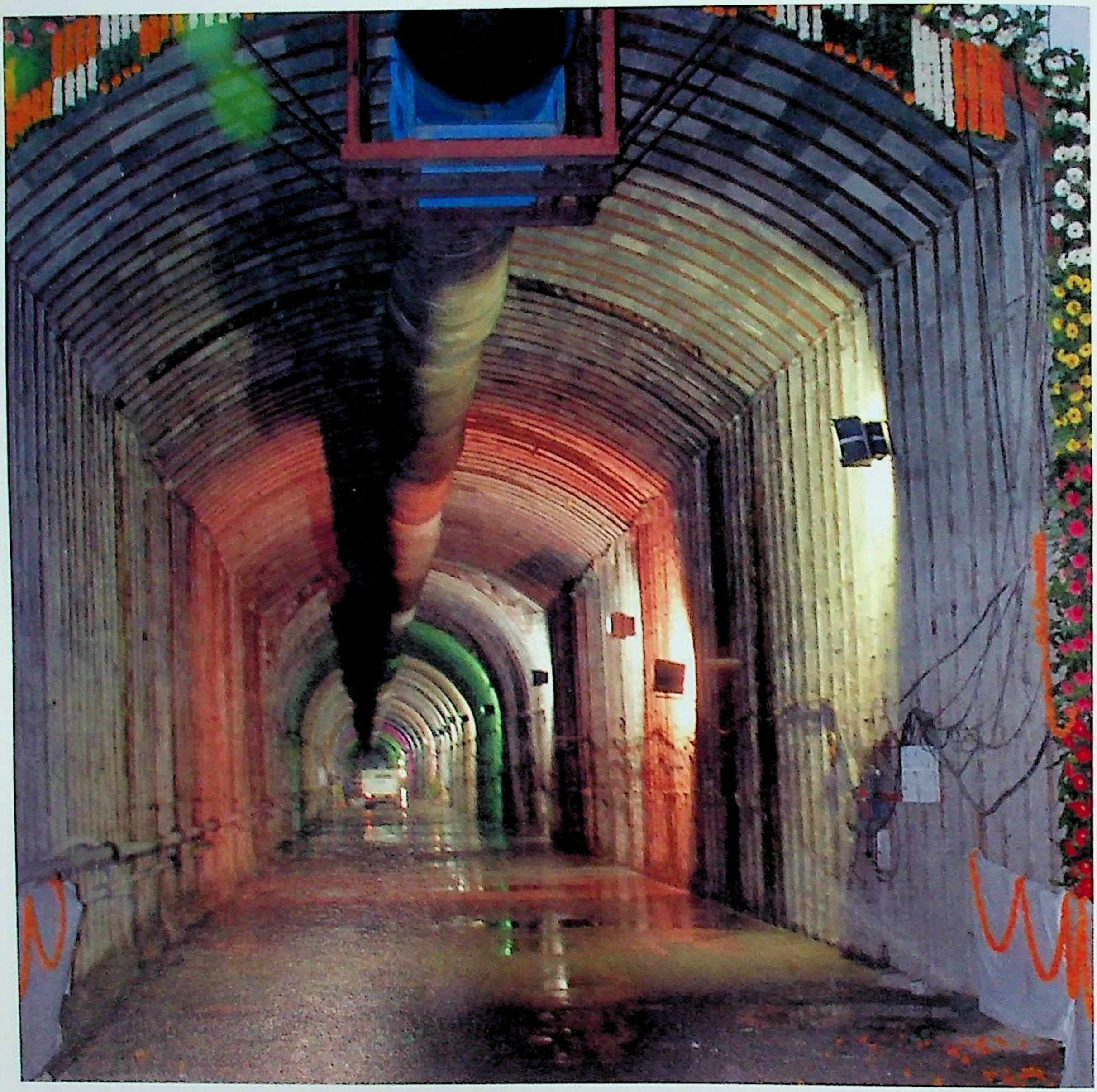
Energy required per day to lift 800 cusecs
= (2,000 x 10^3 kW)/ 80 days
= 25,000 kW/day
= 25,000/24 kWh
= 1,041 kWh @ Head Regulator

O & M Cost per day

At ₹ 4 per kWh with other M&R
= ₹ 100,000* per day

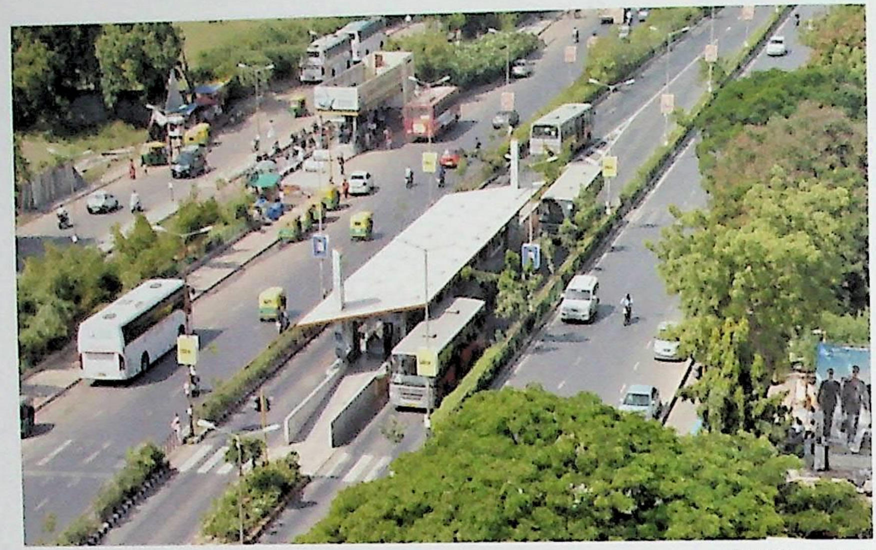
Coal consumption
= 0.67 MT/ MW x 2,000 MW
= 1,340 MT

***1 US$ ≅ ₹ 64.2**



Tunnel
Dedicated to
The Nation

reducing urban warming



BRTS Station
Ahmedabad,
Gujarat

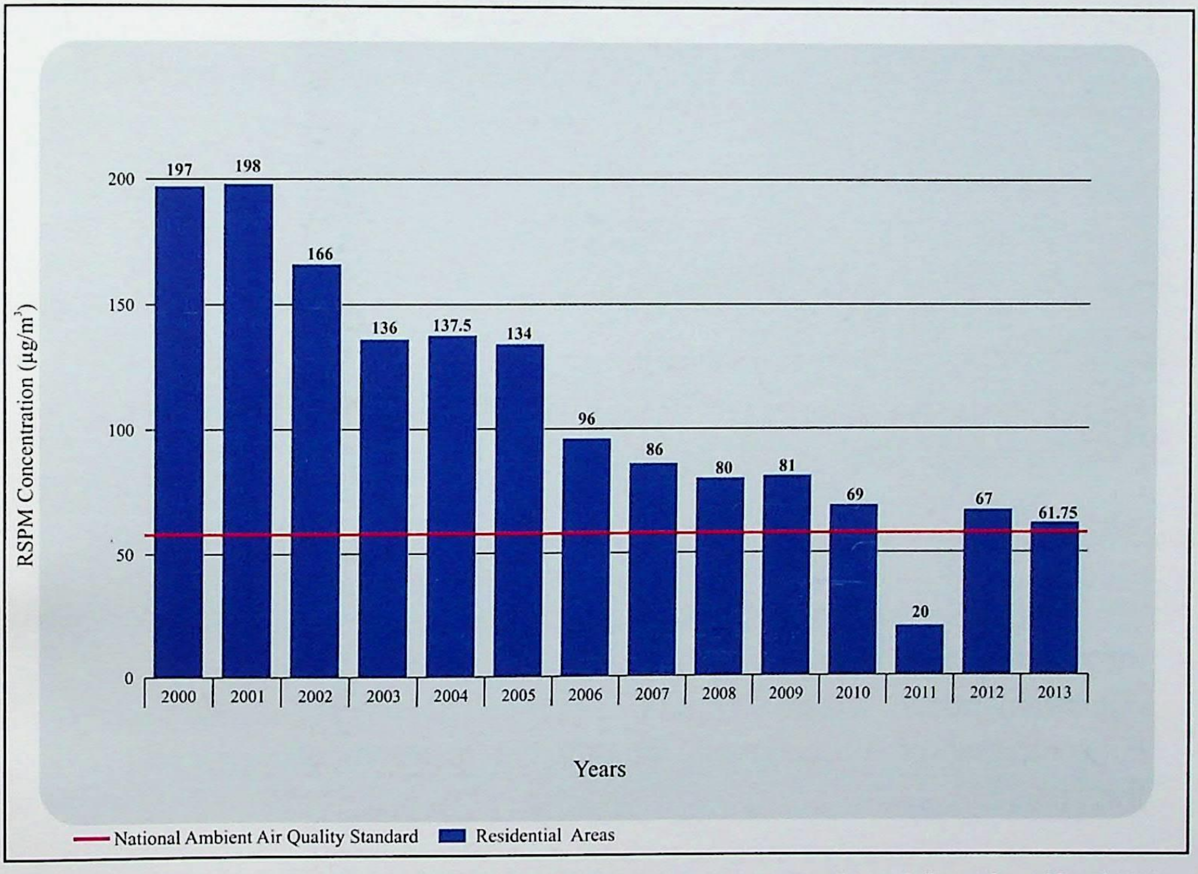
*1 US$ ≅ ₹ 64.2

With the burgeoning population (around 4.5 million) in Ahmedabad city, around eight hundred thousand passengers are ferried every day through a fleet of over one thousand Ahmedabad Municipal Transport Service (AMTS) buses and around 1.9 million private vehicles of all kinds ply on Ahmedabad roads. Therefore, enormous traffic and its congestion is a major source of greenhouse gas emission in Ahmedabad city.

To ease the traffic congestion and simultaneously reduce the GHG emissions, we have carefully planned and executed the Bus Rapid Transit System (BRTS) at a cost of around ₹10,480 million*. This has ultimately reduced the movement of 400,000 vehicles per day. The system carries about 140,000 to 150,000 passengers through BRTS buses which can cater to about 500,000 passenger capacity (in future) over and above AMTS buses. It has been estimated by the Centre for Environmental Planning & Technology (CEPT) University in Ahmedabad, that there would be a net reduction of 14% GHG per annum (mainly CO_2 and NOx) and PM by 15% as a result of this massive project.

In addition to this, more than a dozen flyovers are being executed in Ahmedabad city which would facilitate easy transit of around 200,000 vehicles, ultimately leading to emission reduction.

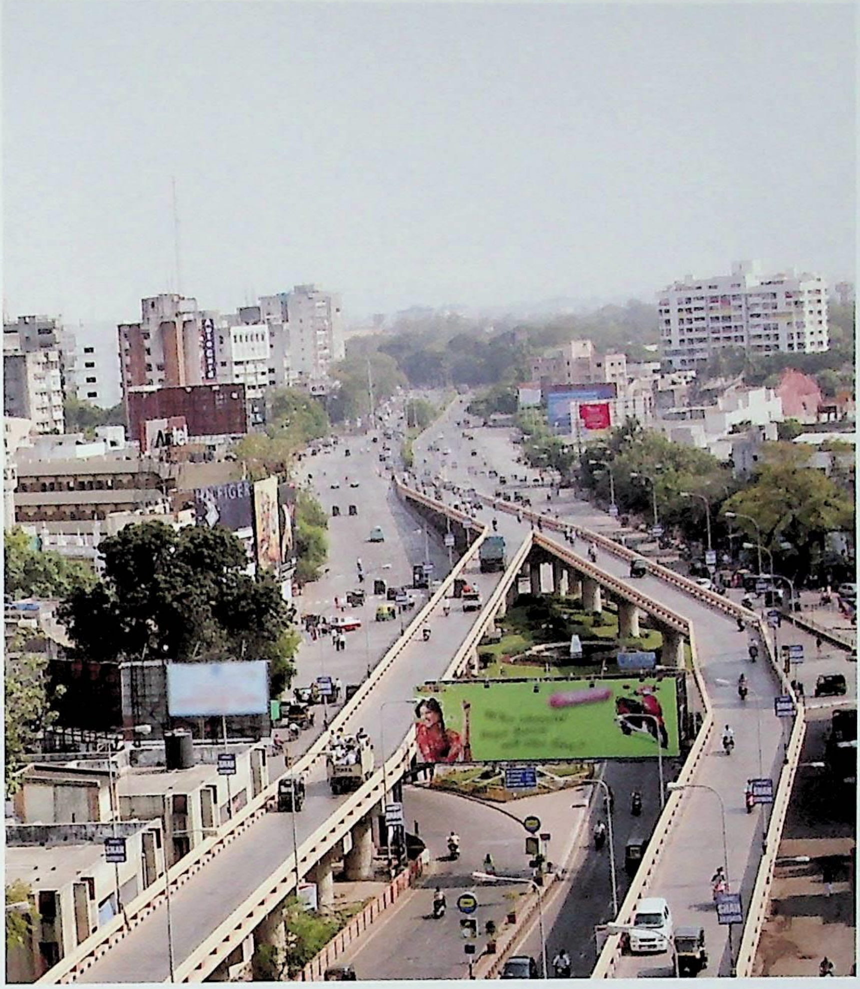
Ambient Air Quality of Ahmedabad City



Gujarat Pollution Control Board, 2014

Flyover
Surat, Gujarat

Similar efforts in Surat, rated as the fastest growing metropolitan city in the State, have resulted in substantial improvements in air quality and reduction of average concentration of air pollutants at different locations of flyovers.



At
Majuragate
Junction
Surat Station

Average Concentration of Air Pollutant ($\mu g/m^3$) in Surat City

Station (Nana Varachcha FOB)	SO_2	H_2S	CO	RSPM	NO_x
Starting (Surat Side)	64	58.69	3350	149	74
Middle (under bridge at junction)	34	38.6	1856	118	28
End Point (Kamrej Side)	69	65.25	3892	155	68

Source: Surat Municipal Corporation, 2015

Changes in Air Quality in Surat (µg/m^3)

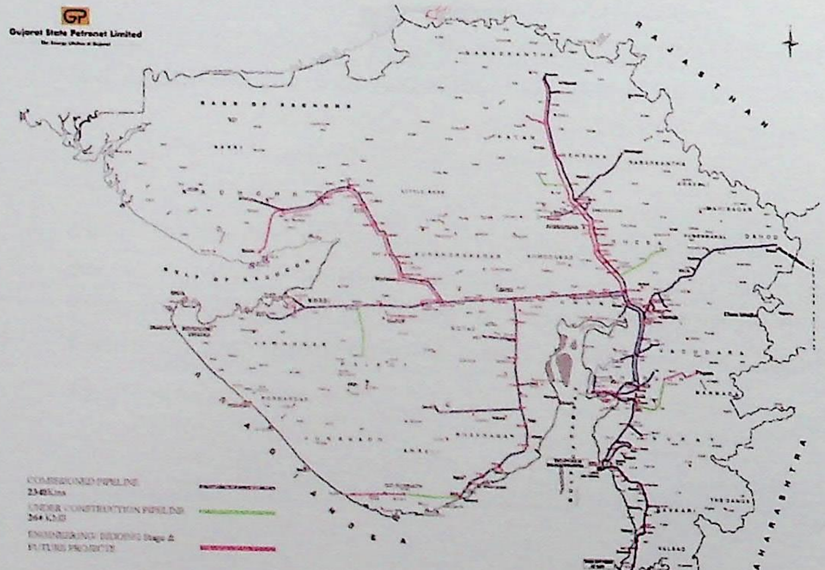
Location Details		SPM (µg/m^3)	RSPM (µg/m^3)	SOx (µg/m^3)	NOx (µg/m^3)	CO (µg/m^3)	HC (µg/m^3)
Varachha Road FOB Reduction of pollutant level at Minibazar	From the level of Khand Bazar	7.4%	6.5%	20%	4.2%	-	-
		112.0	57.0	7.60	18.0	ND	ND
	From the level of Kapodra	6.6%	0%	15%	3.9%	-	-
		98.0	40.0	5.1	9.80	ND	ND
Ring Road FOB Reduction of pollutant level at Textile market	From the level of Udhana Darwaja	26%	34%	23%	27%	-	-
		106.0	48.0	11.01	15.35	ND	ND

Source: Surat Municipal Corporation, 2014

switchover to gaseous green

Considering the fact that Climate Change is not only an environmental issue but also a developmental issue, we have adopted a forward looking and development oriented approach. We had decided to introduce clean fuel mechanism in the State of Gujarat by expanding oil and gas value chain. A State Wide Gas Grid has been established to provide clean and green fuel even to the remote areas of the State.

Around 2,348 km long High Pressure Gas Pipeline (HPGP) has already been commissioned. This pipeline passes through 25 districts of Gujarat and caters the natural gas requirement of various segments like Power, Fertilizer, Refineries, Petrochemicals, Gas Distribution, Sponge Iron, and many other industries including Small & Medium Enterprises. Additionally 264 km of high pressure pipeline is under construction. Gujarat is the only State in the country to have a State Wide Gas Grid and around 650 locations including urban and rural areas are getting the natural gas through this pipeline.


GP
Gujarat State Petronet Limited
RAJASTHAN
MAHARASHTRA
COMMISSIONED PIPELINE 2348Kms
UNDER CONSTRUCTION PIPELINE 264 KMS
ENGINEERING/ BIDDING Stage & FUTURE PROJECTS

Gas Grid Development
Gujarat

GSPC Gas Filling Station

Gujarat

City Gas Distribution Project

Gujarat State Petroleum Corporation (GSPC) embarked upon an ambitious plan of city gas distribution envisaging supply of natural gas to various households, automobile segments, commercial establishments and small scale industries located across Gujarat State. This project also aims at setting up Compressed Natural Gas (CNG) stations at various locations which replaces highly polluting fuels like coal, furnace oil, Liquefied Petroleum Gas (LPG), etc., in small industrial zones with environment friendly natural gas and thereby reducing the levels of CO_2 emission. Pilot CNG stations at Hazira and domestic gas connections in the same location were established in the year 2003 and later attracted several private sector players in city gas distribution project. This has been received by villagers as a boon since they no longer have to trek a few kilometres every day for collecting firewood. There are more than 1,407,000 PNG domestic connections spread across various cities, towns and villages across Gujarat. It is planned to increase this number up to two million during next couple of years. Across the State a network of 358 Compressed Natural Gas (CNG) Stations has been established refuelling more than 270,000 CNG vehicles daily including auto-rickshaws, cars, buses and other vehicles reducing consumption of diesel and petrol and thereby reducing the GHG emission.

CNG Auto
Rickshaw
Ahmedabad,
Gujarat

Following table calculates reduction of CO_2 emission by reducing fossil fuels through use of natural gas in the State of Gujarat:

State of Gujarat – Leader in City Gas Distribution (CGD) Sector in India

Sr. No.	Customer Segment	No. of Customers	CGD Sector Gas Consumption * (MMSCMD)
1	PNG – Domestic	1,407,000	0.70
2	PNG – Industrial	3,900	5.40
3	PNG – Commercial	16,600	
4	CNG – Transport	270,000 Vehicles / Day	1.90
TOTAL			**8.00**

Note: Data of other CGDs in Gujarat are taken from information available in public domain

* Subject to seasonal variation

Source: Gujarat State Petroleum Corporation, 2014

GSPC
Krishna
Godavari
Rig

Pandit Deendayal Petroleum University (PDPU)

Pandit Deendayal Petroleum University (PDPU) is promoted by Gujarat State Petroleum Corporation (GSPC) and established by the Act of Gujarat State Legislative Assembly in the year 2007. The University offers programs to address the need for trained human resources in the domains of Energy including Renewable Energy, Environmental Science, Climate Change, etc.

PDPU has set up world class Solar Research Development Centre (SRDC) with objectives to accelerate deployment of Renewable energy for sustainable growth, foster a clean environment to enhance human standards of living and develop skilled workforce for the same.

This Centre has state of the art facilities for advanced research in the field of solar photovoltaic. There are 19 Scholars pursuing PhD in the field of Solar Energy and the Centre has published more than 100 research papers.

In addition to this, the University is closely working with Gujarat Energy Research & Management Institute (GERMI) & the Climate Change Department of the Government of Gujarat to set up Centre of Excellence to combat the challenges of global warming and Climate Change.

from carbon credits
to green credits

Gujarat Fluorochemicals Plant
District Panchmahals, Gujarat

Clean Development Mechanism (CDM) represents a challenging opportunity for Gujarat to participate in addressing a global concern for which it may not be directly responsible. At the same time it also addresses the socio-economic development priorities.

International regulatory system for CDM, however, being a project focused mechanism, has its own limitations. For instance, we have in place a number of projects and policies (enumerated in different sections of this book) that would directly or indirectly help combat Climate Change. Under CDM's current approach it would, however, be difficult to get credits for our efforts. The recognition of public sector projects under the current CDM guidelines is comparatively difficult vis-à-vis private sector projects. Public sector investment is primarily scattered. There are many projects in different parts of the State depending on the local needs.

If they are bundled together, high cost of project development and validation procedure make such projects difficult to be taken up for CDM. The programmatic CDM, even though well-defined, has not been able to take off and no validators in India are willing to take up such projects. It should be appreciated that public sector projects contribute to sustainable development of the State and it is required that CDM procedure should be broad based in order to encourage such public sector projects/policies.

Green Belt Development

Common Effluent Treatment Plant District Valsad, Gujarat

The total number of Certified Emission Reductions (CERs) already earned in Gujarat State by industries are 32.896 million out of which, 0.414 million CERs are from public sector and 32.482 million CERs are from private sector (till 1st July, 2010). The number of CERs being earned annually (an average of crediting period) in Gujarat State by industries are 13.516 million CERs. As per the total CERs issued till 1st July, 2010 in the country, Gujarat is the highest rated and has generated 41.58% of total issued CERs in India.

CDM - At a Glance in India

State	Total No. of CDM projects (registered, under review and pipeline)	Estimated GHG displacement in tonnage/year (in thousands)	No. of projects registered with UNFCCC	Total CERs issued till 1st July, 2010 (in thousands)
Maharashtra	232	12,822	62	1,319
Tamil Nadu	217	9,525	60	6,836
Karnataka	189	11,577	62	10,181
Gujarat	**176**	**26,458**	**42**	**32,896**
Andhra Pradesh	121	11,468	51	3,639
All India	1,704	149,131	513	79,116

Source: Gujarat Urban Development Corporation, 2010

Navin Fluorine International Plant

District Surat, Gujarat

Top CER Earners

Name of the Industry	Project	CERs earned till 1st March, 2010	All India ranking
Gujarat Fluorochemicals Limited	GHG emission	25.440 million	1st
Navin Fluorine International Limited	GHG emission	6.110 million	4th

Source: Gujarat Urban Development Corporation, 2010

The estimated annual GHG displacement by way of earning CERs is 26.458 million tCO_2 for all projects registered, under review and in pipeline in Gujarat. The estimated GHG displacement is 32.862 million tCO_2 based on total CERs issued till 1st July, 2010 from registered projects in Gujarat.

I have, however, not been too comfortable with Carbon Credit system since it kind of reflects "wrong doer's penance" in monetary terms.

CDM Project
District Surat, Gujarat

CDM Project in Surat City

Surat Municipal Corporation (SMC) has undertaken CDM projects to utilise methane gas, which is generated during sewage treatment. It has done so by installing a Sewage Gas based Power Plant. The project is designed to generate sewage gas by treating the sludge generated from primary and secondary clarifier of sewage in an anaerobic processing system (Digester) so as to restrict the atmospheric emission of methane gas. At the same time methane gas is recovered without leak in the atmosphere.

The electricity generated from the utilisation of sewage gas in the gas engine is used for captive purpose. Thus greenhouse gas reduction by fossil fuel consumption reduction for grid power supply equivalency is, therefore, possible.

SMC commissioned India's first Sewage Gas based Power Plant (SGPP) of 0.5 MW capacity at Anjana Sewage Treatment Plant (STP) in 2003. It also commissioned three SGPP, each of 1.0 MW capacity in year 2008 at different STPs. These Power Plants have generated more than 12.888 million kWh electricity and reduced the GHG emission equivalent to 52,100 tCO_2. For registration under CDM, these projects fall under the small scale in following categories:

- TYPE III.H: Methane recovery in wastewater.
- TYPE I.D: Grid connected renewable electricity generation

The annual expected CERs from these two categories are 39,630 and 16,624 respectively.

Constellation Plantation

Gandhinagar,
Gujarat

Punit Van – Trees and Constellations

According to Indian astrology, the particular constellation in which a person is born, keeps influencing his life in different ways – good or bad, depending on particular position of that constellation. In order to get rid of the evil influences and to invoke the divine goodness to be bestowed upon him, a person has to perform certain religious rituals. It is also mentioned in our ancient scriptures that if a particular plant that is associated with a definite constellation is planted, nurtured and worshipped, the ill effects of that particular constellation could be neutralised and over a period of time get converted into positive influence. There are 27 constellations and each one of these is associated with one or more plants species.

'Punit Van' is a plantation of trees in the capital city of Gandhinagar signifying an association of trees with constellations, sunsigns, etc. We enhance peoples' awareness of these concepts by way of film shows in the open air theatre there and also by maintaining a nursery of 'theme specific seedlings' for people to obtain plants of their choice and as per their astrological constellations.

Constellation Forest

Name of Constellations	Local Name of Plant	Botanical Name of Plant
Ashwini	Zercochla / Kadayo	*Strychnos nuxvomica Sterculia urens*
Bharni	Amli	*Tamarindus indica*
Krutica	Udambar	*Ficus racemosa*
Rohini	Jamun	*Syzygium cumini*
Mrugshirsh	Khair	*Acacia catechu*
Adhra	Sisoo	*Dalbergia sissoo*
Punarvasu	Vans / Bamboo	*Bambusa arundinacea*
Pushya	Pipal	*Ficus religiosa*
Ashlesha	Champo	*Michelia champaca*
Magha	Vad	*Ficus benghalensis*
Purva-Falguni	Palas / Khakhro	*Butea monosperma*
Uttar-Falguni	Palaksha / Pipli	*Ficus rumphii*
Hasta	Juii / Jasmine	*Jasminum aurioulatum*
Chitra	Bili / Bel	*Aegle marmelos*
Swati	Arjun sadad / Arjun	*Terminalia arjuna*
Vishakha	Vikro	*Gymnosporia spinosa*
Anuradha	Gugal	*Commiphora wightii*
Jyestha	Semal	*Salmalia malabarica (Bombax malabaricum)*
Mul	Amaltas / Garmalo	*Cassica fistula*
Purvashadha	Netar	*Calamus rotang*
Utrashadha	Kathal / Phanus	*Artocarpus integrifolia*
Shravan	Oak / Akdo	*Callotropis procera*
Ghanistha	Sami / Khijdo	*Prosopis cineraria*
Shat-tara	Kadamb	*Anthocephalus cadamba*
Purva-Bhadrapad	Aam	*Mangifera indica*
Utra-Bhadrapad	Neem	*Azadirachta indica*
Revi	Mahuva	*Madhuca indica*

Zodiac Plantation

English Name Zodiac	Local Name of Zodiac	Local Name	Botanical Name
Aries	Mesh	Umro / Amla	*Ficus glomerata / Embelica officinalis*
Taurus	Vrushabha	Khair / Jambu	*Acacia catechu / Syzygium cumini Ficus glomerata*
Gemini	Mithuna	Khair / Bili	*Acacia catechu / Aegle marmelos*
Cancer	Karkata	Pipal / Bili	*Ficus religiosa / Aeglemarmelos*
Leo	Simha	Vad / Khakro	*Ficus bengalensis / Butea monosperma*
Virgo	Kanya	Bili / Jui	*Aegle marmelos / Jasminium auriculatum*
Libra	Tula	Bili / Arjun	*Aegle marmelos Terminalia arjuna*
Scorpio	Vrushchika	Gugal	*Commiphera wightii*
Sagittarius	Dhanu	Netar	*Calmus rotang*
Capricorn	Makara	Phanus	*Artocarpus intigrifolia*
Aquarius	Kumbh	Aam / Kadam	*Mangifera indica Anthocephalus cadamba*
Pisces	Meena	Neem / Limdo	*Azadirechta indica*

Zodiac Plantation
Gandhinagar, Gujarat

Mangrove Species: *Rhizophora Mucronata & Avicennia Marina*
District Jamnagar, Gujarat

There is a need to develop a more positive approach. With this in mind I exhorted my officials to develop the innovative scheme of 'Green Credits'. Sometimes the socio-economic and infrastructure development projects necessitate the acquisition of lands that have been declared as protected under Forest Conservation Act, 1980 in India. Development of compensatory afforestation after the non-forest usage may take many years and till then there are bound to be adverse impacts on the environment.

Gujarat has a long coastline of about 1600 km (the longest amongst all the Indian states) which covers 15 coastal districts. These areas are prone to coastal surges in the form of cyclones, storms etc. Therefore, a need was felt for an effective and resilient coastal bio-shield to mitigate the effects of coastal disturbances caused by climate change. It is widely accepted that mangroves form one of the most effective and resilient coastal bio-shields. Keeping this in view, we gave due importance to the development and conservation of mangrove forests in the State. Consequently, large scale mangrove plantations have been initiated by involving local people and even industries and Corporate Houses. In 2010, during the Golden Jubilee celebrations of the formation of the State, Mangrove afforestation and conservation was adopted as one of the Golden goals by us. The annual plantation targets were enhanced, plantation techniques were revisited and wider peoples' participation was ensured. As a result, the State registered consistent increase in its mangrove cover. The State now hosts the second largest mangrove cover of the country (1103 sq. km). Between 2011 and 2013, the State also registered an increase by 45 sq. km in its mangrove cover. In view of the large scale coastal area industrial development in the state, this has been significant achievement in the direction of balanced and sustainable development.

Mangroves are the most important carbon sinks in the coastal and intertidal mudflats. We also sponsored a special study to assess the carbon sequestered by its mangroves. The study has revealed that the mangroves of the state have sequestered about 8.116 million tons of carbon which is equivalent to 29.760 million tons of carbon dioxide. Having acknowledged the significance of mangroves, we also got surveyed the entire coastline and identified 149 major mudflats covering about 3,000 sq. km of intertidal areas as the mangrove potential areas which are being developed as mangrove habitats which would add more mangrove cover to the State coastline.

Trees and Religious Beliefs

Preservation and conservation of trees, natural flora and fauna have been integrally connected with Indian beliefs, religious notions and way of life. In my early childhood, I distinctly remember how my grandmother forcibly dissuaded one of my uncles from getting into timber trade. The reason was that she equated this trade with butcher's profession. In her system of religious beliefs, cutting of trees was tantamount to the butchering of living beings. My grandmother was a simple semi-literate lady but she possessed a very strong sense of conviction for conservation of nature. Later in life during my visits to Himalayas for self-exploration and self-realisation, I had many occasions to meet a number of spiritually enlightened souls who exhibited unflinching dedication and single minded devotion towards the preservation of nature to the extent of equating it with the worship of God.

Shri Pandurang Shastry Athvale was one of the best known socio-religious preachers in Gujarat. He will be known for many centuries to come for his work in exhorting coastal communities for renunciation of evil social practices. 'Pandurang Dada', as he was known affectionately, went out of his way to establish 'tree temples' in Gujarat in order to generate religious reverence for trees and thereby create a social ethos for conservation of nature. Some communities in Gujarat, on certain instances of tree felling have been observing the same rituals as are performed after death of human beings.

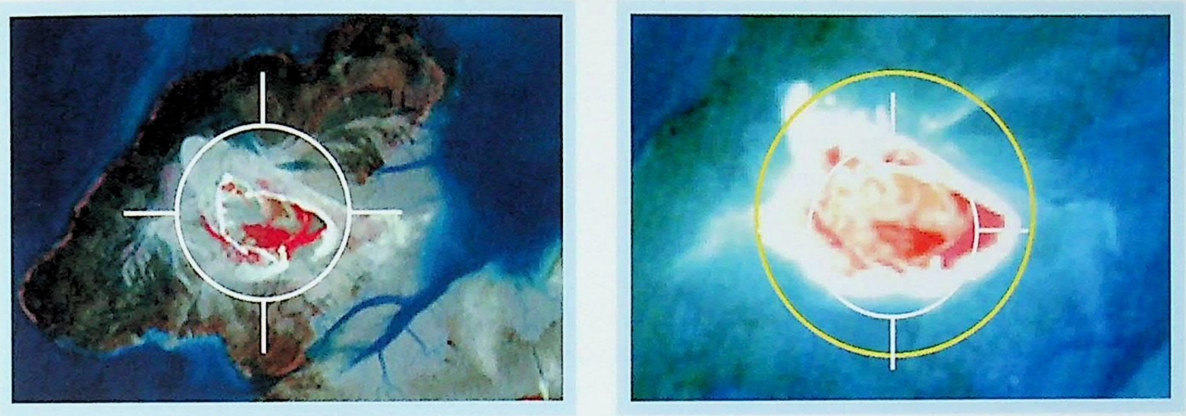
These personal and socio-cultural beliefs have always motivated me to go for massive tree plantations, preventing tree felling as far as possible, incorporating nature conservation and environment protection as an important ingredient in my party's manifesto during elections and even import necessary mechanical tools from Canada, for shifting big grown up trees, if unavoidable developmental requirements made it necessary.

In olden times in India, most cities were protected by a defence wall constructed around its periphery. In recent times in Gujarat, I have been advising urban local bodies to go in for massive tree plantations around the cities to make a defence line against global warming.

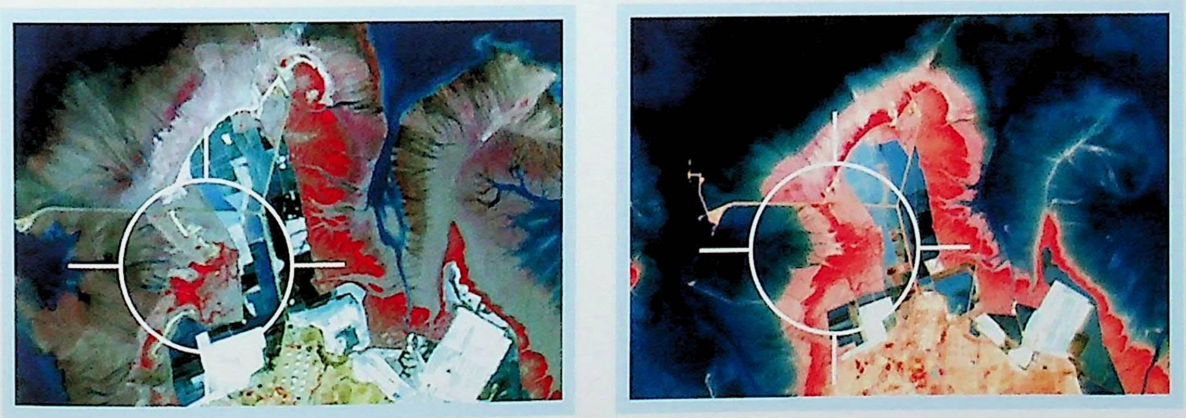
Increase in Mangrove Cover (2001 - 2013, Indicated by Red Tone) Satellite Imagery

January 1, 2001

January 12, 2013



Pirotan Island, Gulf of Kutch, District Jamnagar, Gujarat

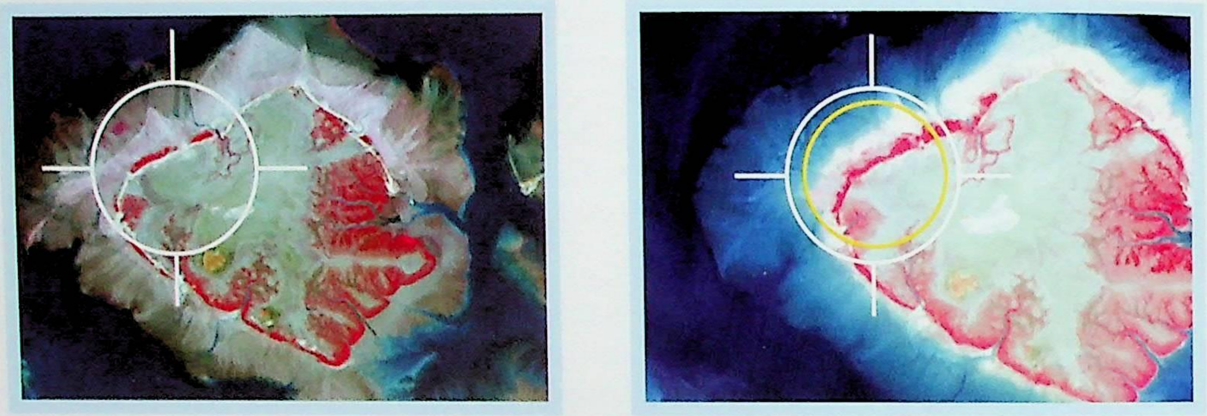


Narara, Gulf of Kutch, District Jamnagar, Gujarat

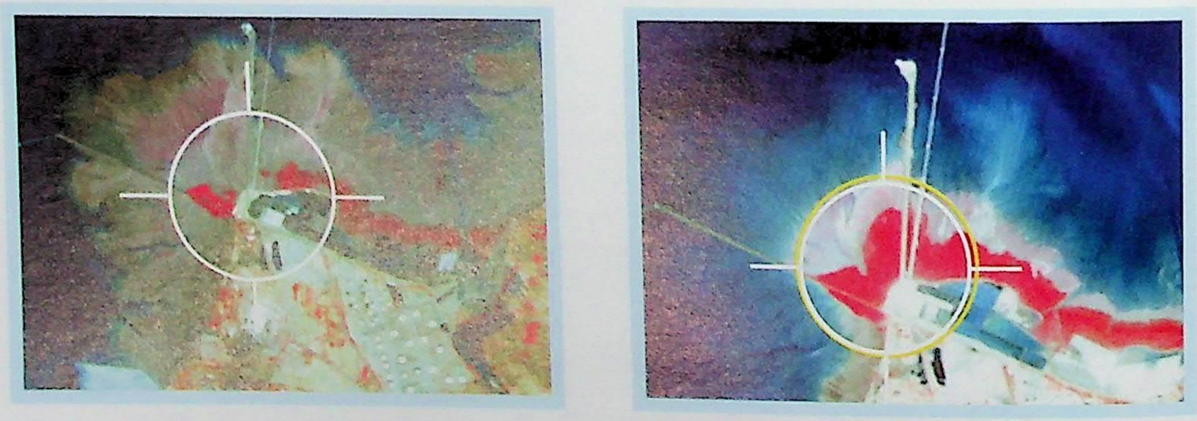
Increase in Mangrove Cover (2001 - 2013, Indicated by Red Tone) Satellite Imagery

January 1, 2001

January 12, 2013



Kalubhar, Gulf of Kutch, District Jamnagar, Gujarat

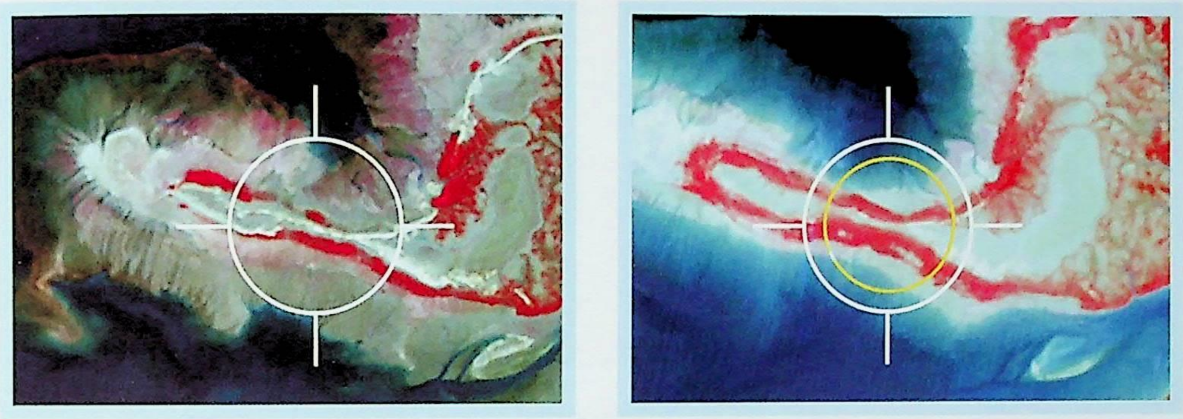


Sikka Coast, Gulf of Kutch, District Jamnagar, Gujarat

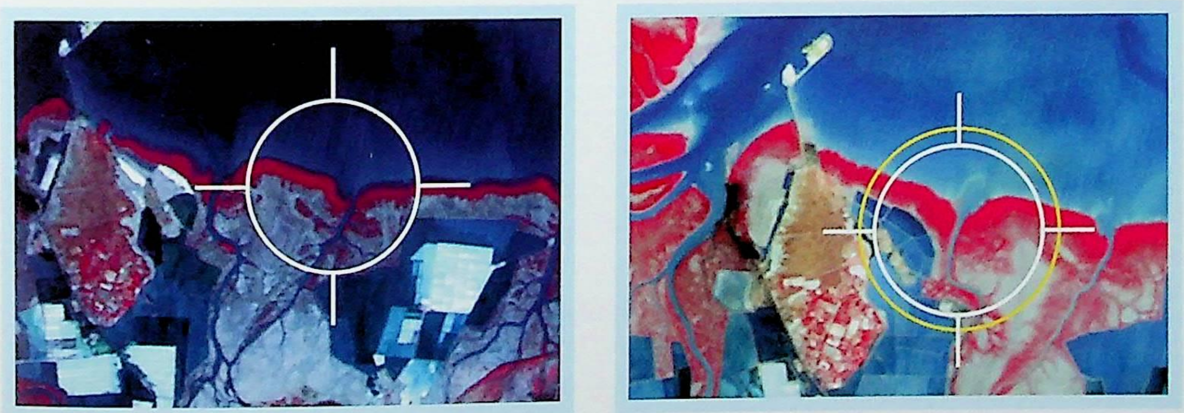
Increase in Mangrove Cover (2001 - 2013, Indicated by Red Tone) Satellite Imagery

January 1, 2001

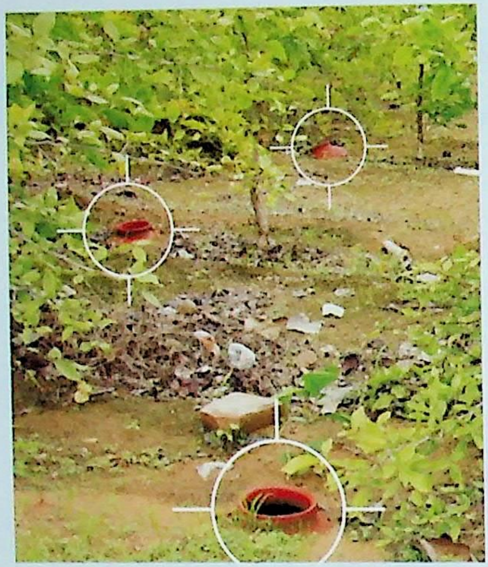
January 12, 2013

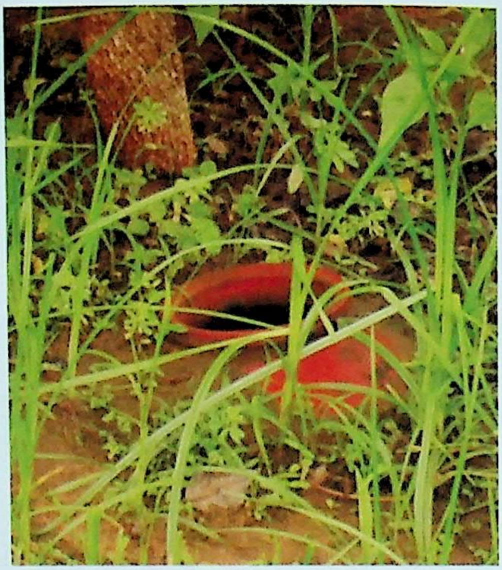


Dedeka-Mundeka Island, Gulf of Kutch, District Jamnagar, Gujarat



Jamnagar Coastal Area, Gulf of Kutch, Gujarat





Sow trees – Sow earthen pots

We still have traditional method of cooling water in earthen pots sculpted by village potters. Come summers and millions of earthen pots are made and sold in rural, semi urban and even several parts of urban India. Gujarat is no exception to this. However, within one season these pots lose their cooling ability necessitating owners to purchase new ones with the onset of next season. Old ones get thrown away.

I have been advocating reuse of these pots by making a small hole at the bottom and filling that with a knot of thread (traditional way of dripping water droplets for ablution of Linga of Lord Shiva in India). If these improvised earthen pots are also buried in ground, leaving their mouths open, next to any sapling; then one refill would be enough to drop irrigate the sapling for a few days. Hundreds of thousands of children, students and youths have adopted this method reducing the mortality of saplings in water scarce areas of Gujarat. Hence, every year on World Environment Day, my mantra is 'Sow trees – Sow earthen pots'.

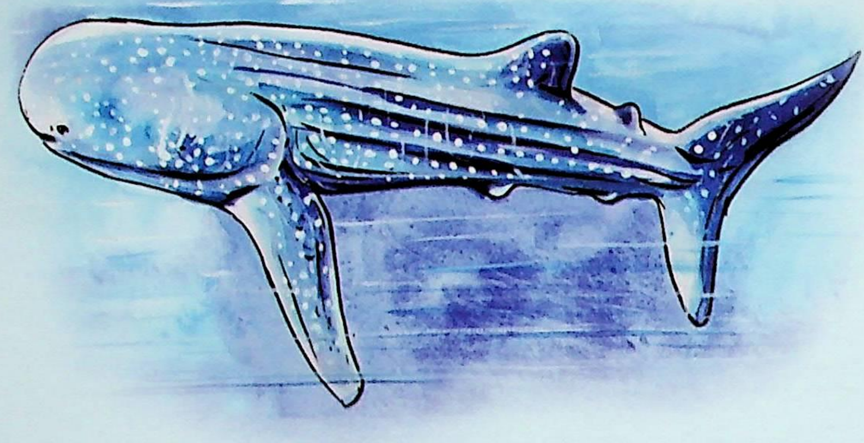
Conservation of Asiatic Lion

Ancient Indian scriptures postulate that different elements of nature are interlinked and inter-dependent and therefore, forest and wild life are inter-dependent. In Mahabharata- the great Indian epic, it is described that forests cannot survive without tigers and latter cannot survive without forests.

In Gujarat we initiated an era of commitment towards wildlife conservation. We reviewed the conservation strategy in totality. To meet the objective of lion conservation a special purpose vehicle namely the Gujarat Lion Conservation Society was created. A package of ₹ 400 million led to strategic change in the efforts and policies for lion conservation. The major action points included increase in staff strength, intensive monitoring, enhanced staff mobility, improvement of habitat, use of modern technology, inter - sectoral coordination to optimize synergy for protection, enlisting people's support, effective management of man - animal conflicts, state of the art animal rescue and care centers, creation of DNA and genetic research lab for genetic research and better disease surveillance, better veterinary care, socio economic care and development of local people. As a result of these endeavours the Asiatic lion population in Gir National Park and Wildlife Sanctuary rose from 327 in 2001 to 523 in 2015. The annual growth rate of the lions between 2001 and 2015 has been phenomenal at 5.45 %.

***1 US$ ≅ ₹ 64.2**

Conservation of Whale Shark



Whale sharks come to the shores of Gujarat for breeding. Till the turn of the century, these majestic and giant fish used to get trapped in fishermen's nets and each such fish catch used to bring fortune to the fishermen as one whale shark would easily fetch them about ₹0.2 to 0.3 million. Very little was known about these fish and their hunting till 2000. As the shocking details of the threats to Whale Sharks surfaced we decided to address the issue of Whale Shark conservation.

In coordination with Gujarat Forest Department, the Wildlife Trust of India and the local fishermen community we initiated a comprehensive whale shark conservation programme in Gujarat in 2004. Mass communication campaign was initiated with the local communities in coastal villages. In addition to numerous street plays, community meetings, rallies, and students' awareness programmes, we involved religious leaders who motivated and exhorted the fishermen to consider whale sharks as **"Whali"**- (a dear daughter who comes here for giving birth to young ones). This emotional appeal worked like magic on the local fishermen. They vowed to conserve the **"Whali"** and decided to release the fish into sea waters whenever it would accidently be caught in the fishing net. Interestingly, 8 cities in Gujarat adopted Whale shark as their Mascot.

The process of release would require cutting the net and the fisherman would lose his livelihood. Considering this we provided the much needed support and announced a compensation up to ₹25,000/- per net if the fisherman loses his net while releasing the whale shark. We simplified the process of payments to the fishermen in 2012 and permitted self documentation to support their compensation claims.

The conservation action which we started in 2004 has already resulted in the release of 472 whale sharks in sea waters from 2004 up to 2014. The fishermen have so far been given about ₹6.23 million as compensation towards the loss of nets from 2004 to March 2014. This is a profound success story. The programme received the India Biodiversity (second place) award in 2014.

***1 US$ ≅ ₹ 64.2**

energy reforms essential for mitigation

219.067 MW Dhuvaran Gas Based Combined Cycle Power Plant

Gujarat State Electricity Corporation Ltd.
District Anand,
Gujarat

During my initial years of governance in Gujarat, Energy Sector Reforms posed a daunting challenge due to their serious political fallouts, since it would concern millions of farmers in the State, in addition to dealing with strong unions of workers and other vested interests in the gigantic Government Electricity Utility. Even before the Central Government in India enacted the Electricity Act, 2003, in September the same year I got a careful road map prepared suggesting the framework for separation of generation, transmission and distribution of electricity in my State to make the power sector more dynamic and sensitive to the needs of changing times. And hence, we enacted Gujarat Electricity Industry (Reorganisation and Regulations) Act in May, 2003. This resulted in unbundling of massive and almost unmanageable Gujarat Electricity Board into several separate companies for generation, transmission and distribution. In those early reform years, while we sufficiently recognised the need to provide uninterrupted power supply to the people and specially to those in rural areas; we also consciously took into account the higher costs in terms of financial resources and the adverse impacts of burning of fossil fuel for the generation of required power due to the emission of greenhouse gases. Therefore, along with taking measures for cost efficiency, I particularly emphasised on efficient use of electrical energy by reducing transmission and distribution losses and encouraging the use of energy efficient equipments.

374.571 MW
Utran Extension
Gas Based
Combined Cycle
Power Plant
Gujarat State Electricity
Corporation Ltd.
District Surat, Gujarat

Improvement in Power Generation Efficiency

The State Power Utilities have been adopting better Operation and Maintenance (O&M) practices to reduce Station Heat Rate, Auxiliary Consumption, etc. The energy audits of power plants have been carried out and by implementation of recommendations given in the energy audit reports, the generating stations have achieved approximately a saving of 13,036 MWh of energy per annum. Renovation and Modernisation (R&M) of low performing units in phased manner (Kutch Lignite Thermal Power Station

(KLTPS) 1 & 2, Ukai 1 & 2 and Gandhinagar 1 & 2) has been carried out.

Due to the use of washed coal, the energy consumed in transportation, handling and milling has been optimised as the inert material from coal is eliminated. This helps in reducing the auxiliary consumption of equipments involved in coal processing because the use of improved coal ultimately results in reduction of emission of GHG as compared to conventional coal.

Gas Based Combined Cycle Power Plant
District Surat, Gujarat

For reducing the transmission losses and improving power factor, lines with higher transmission voltages have been laid. More number of high voltage sub stations have been set up and capacitor banks have been installed at various sub stations in the State.

Distribution efficiency measures include installation of Energy Efficient Submersible Pump sets on agricultural locations, installation of Automatic Power Factor Control Panels for improvement in Power Factor and providing Amorphous Transformers by gradually replacing conventional Transformers in the Distribution Network. These activities have cumulatively resulted in substantial energy savings and efficient use of available energy.

The combined efforts of reforms in Generation, Transmission and Distribution Sectors have moderated the requirements of additional generation of electricity using fossil fuel in order to meet the increase in demand of electricity. By improving the overall efficiency of the power plants and improving the performance standards of Transmission and Distribution network lesser emission of the GHG has been achieved.

From 2000-01 to 2007-08, Gujarat's net electricity generation (Million kWh) has increased by 28.75% and the CO_2 intensity (tCO_2 /MWh) has reduced by 4.18% vis-a-vis India's net generation, which has increased by 37.34% and CO_2 intensity has reduced only by 0.93%.

Promoted Gas for a Better Tomorrow

GSECL has set up 219 MW Gas Based Combined Cycle Power Plant at Dhuvaran (District Anand). The estimated reduction in CO_2 emission from this project is 214,000 tCO_2 per annum. GSECL has taken up implementation of highly efficient 375 MW Combined Cycle Gas Based Power Plant at Utran (District Surat) on Engineering, Procurement and Construction (EPC) basis.

Fuel Conversion

Gujarat Alkalies and Chemicals Ltd (GACL) 90 MW captive power plant was converted from Naphtha to Gas in 2001 and was registered as a CDM project. Due to this the estimated reduction in CO_2 emission is 99,462 tCO_2 per annum.

Gujarat Industries and Power Corporation Ltd (GIPCL) 140 MW power plant has been switched over from Naphtha to Gas in 2003. As a result of this, the estimated reduction in CO_2 emission is approx. 80,000 tCO_2 per annum.

Others

In view of high Global Warming Potential (GWP) of N_2O gas, State owned Gujarat Narmada Valley Fertilizer Company has put a special catalyst in the ammonia combustion furnace for reducing emission level. The equivalent CO_2 emission reduction will be 332,948 CER, taking 310 GWP as a factor for N_2O.

Impact of Transmission and Distribution Losses and Generation Efficiency

The Transmission & Distribution (T&D) loss during the year 2001-02 was 34.20% and the generation efficiency, i.e. Plant Availability Factor (PAF) was 69.13%. The conventional installed capacity was 8,657 MW at the end of 2001-02, which was increased to 19,588 MW at the end of 2014. The peak power demand was 7,064 MW and 14,005 MW in corresponding years. During 2001 to 2014, the T&D losses were reduced by 17.29% and the generation efficiency was increased by 15.38%, with conventional capacity addition of 10,931 MW - equivalent to 157% of the additional generation demand of 6,941 MW. Thus, the total increase in power demand is 98%, while the actual capacity addition is 126% i.e. more than double in last 13 years. The year wise details of installed capacity, demand catered to, T&D losses, etc. are tabulated below:

Year	Installed capacity in MW	% PAF	Maximum Demand catered to in MW	Energy Generated in million kWh	% T&D Losses
2001-02	8,657	69.13	7,064	44,020	34.20
2002-03	8,582	70.58	7,743	46,794	35.90
2003-04	8,689	69.81	7,605	46,123	30.90
2004-05	8,761	72.02	8,077	49,437	30.64
2005-06	8,977	72.48	8,170	52,232	26.51
2006-07	9,561	70.48	8,538	53,520	22.20
2007-08	9,942	80.29	9,335	58,825	21.80
2008-09	9,864	77.68	9,437	60,826	21.14
2009-10	12,008	77.46	9,883	69,883	24.22
2010-11	13,314	79.75	10,461	71,256	20.13
2011-12	15,306	82.36	11,209	78,651	20.44
2012-13	18,270	83.65	12,348	87,723	23.60
2013-14*	18,510	84.51	12,577	86,221	16.91

*Installed Capacity - 19,588MW & peak demand – 14,005 MW at the end of 2014. Moreover, present installed capacity from RE sources – 4,385 MW Source: Energy and Petrochemicals Department, 2014

Gas (Cleaner Fuel) Based Power Stations Installed in the State

Existing Gas Based Power Stations in Gujarat

Station's Name	Capacity in MW
Utran Gas Based	510
Dhuvaran Gas Based - Stage-I & II	219
Dhuvaran Gas Based Expansion Project	376
Gujarat State Energy Generation Ltd, Hazira	156
Gujarat State Energy Generation Ltd, Hazira Expansion	351
Gujarat Industries Power Company Ltd - Stage I	145
Gujarat Industries Power Company Ltd - Stage II	165
GSPC Pipavav Power Company Ltd	702
CLP India (erstwhile GPEC)	655
Essar Gas based Power Station	300
Sugen CCPP	1,147
A E Co. (Torrent)	100
NTPC Gandhar - GPS*	648
NTPC Kawas - GPS*	645
Total - MW	**6,119**

*State's share from Kawas & Gandhar is 187 MW & 237 MW resp.

Gas Based Power Stations under implementation in Gujarat

Station's Name	Capacity in MW
Unosugen CCPP	383
DGEN Mega Power Project	1,200
Total - MW	**1,583**

Source: Energy and Petrochemicals Department, 2014

Growth Of Gas Based Power Stations

Year	India / Gujarat	Total Conv. Installed Capacity (MW)	Gas Installed Capacity (MW)	% of Total Installed Capacity	% increase compared to 2003
2002-03	India	107,877	11,633	10.78%	-
	Gujarat	8,606	1,967	22.86%	-
2014-15 (Oct-14)	India	221,737	21,388	9.65%	84%
	Gujarat	19,588	5,250	26.80%	167%
2016-17	India*	288,414	22,971	7.96%	97%
	Gujarat	23,287	6,833	29.34%	247%

(*CEA - Expected by the end of 12th Five Year Plan)

Source: Energy and Petrochemicals Department, 2014

Energy Efficiency in State Capital

It is a fact that comfortable standard of living and quality of human life has become increasingly dependent on energy. The only way to cope up with such growing dependence is adoption of energy conservation measures in every possible way. What better example to spread this message across the State could be than to adopt such measures in the capital city of Gandhinagar within the Government's Secretariat Complex housing all the Ministries and State Government offices. The fact that total power demand of Government buildings in the capital city was 10 MW with an annual electricity bill of ₹ 150 million*, prompted me to begin this campaign from the Secretariat Complex. This complex comprising of a four-storied Legislative Assembly Building, ten blocks of ten-storied buildings and four blocks each of three-storied buildings, had an annual electricity consumption of 7.87 million kWh in the year 2001-2002, costing about ₹ 35.38 million*.

Details of Electrical Installations in Secretariat Complex, Gandhinagar, Gujarat

Electrical Utility	Numbers/Capacity
1,000 kVA Transformers	8
Pumps for Water Supply	2 (41 HP), 4 (25 HP)
Central Air-conditioning (A.C.) Plant	1,050 Tonnes
1.5 Tonne Window/Split Air-conditioner	500
150 litres Water Coolers	125
Lifts (Elevators) 2.5 m/s, 1.5 m/s, 1 m/s	46
Escalators	4
Ceiling Fans	12,000
Tubelight Fittings	27,000
Computers	8,500
Light Poles in compound	210
Halogen Fittings in Assembly Hall	48 (1,000 watt each)

Source: Roads and Buildings Department, 2009

For the contract demand of 3,400 kVA, 11 kV electrical supply has been arranged from Torrent Power A.E. Co. Ltd., Ahmedabad.

The following energy conservation measures were adopted with an additional investment of ₹ 13.8 million* in stages. These resulted in total savings of 6.103 million kWh from July 2002 to June 2009:

***1 US$ ≅ ₹ 64.2**

- Replacing 17,500 conventional tubelights with T/5 tubelights to reduce electricity consumption by 44%.
- Application of Sustained Red Green & Blue Light (SRGB) fittings by replacing 1,000 watts Halogen fittings in Assembly Hall to reduce electricity consumption by 67% (illumination level increased from 350 to 550 lumens).
- Replacing conventional Light fittings in the campus with Metal Helide fittings to reduce consumption by 40%.
- Replacement of conventional Cooling Tower by FRP Cooling Tower (1,500 TR) to reduce consumption by 210 HP.
- Staggering the timings of the lifts - considering the office timings of 10.30 to 18.10 hrs, in each Block 2 lifts operated only in rush hours, i.e. 10.00 to 11.00, 14.00 to 15.00 and 17.30 to 18.30 hrs, for the remaining time period only 1 lift operative.
- Replacement of 130 window type AC machines by new ones to increase efficiency.
- Staggering the timings of AC Plants.
- Monitoring the Transformer load – stopping three 1,000 kVA Transformers for at least three months in winter.

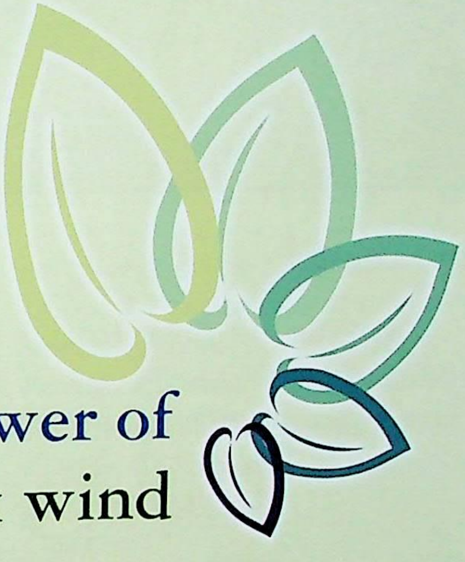
These measures not only proved to be helpful in reducing energy consumption, but also helped in maintaining the maximum demand constant, despite an additional 800 kW load during this period. Thus, an additional saving of ₹ 7.20 million* was achieved in terms of probable increase in fixed charges, which otherwise would have become necessary due to an increase in load of 800 kW.

*1 US$ ≅ ₹ 64.2

A similar example is that of the street lights in the capital city of Gandhinagar. Replacement of 7,500 conventional lamps of 100 watt each with 14 watt T/5 tubes has resulted in yearly savings of 2.35 million kWh of electricity with a financial saving of ₹ 7.65 million* per year. Having implemented this in the year 2004-05, the total energy saving realised on account of these measures alone is 8.56 million kWh, which is worth ₹ 20.30 million*.

Installation of load managers in the Main Road Switching Points, microprocessor based easy ON/OFF system for street lights (based on actual Sunrise and Sunset pattern), total Dim Down system, phase wise Dim Down system, continuous filtered power and GSM based connectivity for effective monitoring of switching points are some of the measures that are planned to be implemented in near future in order to save energy even amidst a demand scenario which is ever increasing.

***1 US$ ≅ ₹ 64.2**



the eternal power of sun & wind

800 MW Wind Power Generation Project
District Jamnagar, Gujarat

Wind Energy

The State of Gujarat has a very high potential for harnessing Wind Power in view of its windy sites along the 1,600 km coastline besides its inland potential sites. As per the latest Wind Resource Assessment study, 34 % of the country's total potential exists in Gujarat with the figure pegged at 35,000 MW.

Gujarat –Wind Power

Installed Capacity: 3,387 MW
No. of Turbines: 3,200
No. of Windfarm Substations: 42
Electricity generated: 24,493million Units
Carbon Emission Avoided: 5.46 million Tonnes
Coal Usage Avoided: 45 million Tonnes
RPO Compliance: 94 %
Investment in million: US $ 2,910
Average Plant Load Factor: 23 %

The Sun and The Wind

The traditional story about the mythological competition of superiority between Sun and the Wind was narrated to me during my childhood by one of the teachers in primary school. These two great forces of nature squabbled with each other in order to prove their strength and superiority. When the argument failed, they decided to test their strengths by focusing on a lone pedestrian wearing a heavy cloak. The condition was, whoever would cause the traveller to take off his cloak, would be declared the winner and hence stronger.

First blew the Wind and the Sun retired behind a cloud. The harder it blew the tighter the traveller wrapped the cloak round himself and at last the wind had to abandon its effort in utter despair. Then came the Sun shining brightly in the sky and throwing its blaze with full force. After a while, the traveller found it hard to walk due to blistering heat and perspiration. Ultimately, he took off his cloak and put it on his shoulders. The Sun defeated the Wind.

The story had a different moral context – persuasion and kindness have greater and more effective results than severity. These values were inculcated upon my mind in those initial years of school. However, the story also made an everlasting impact on my mind about the Eternal Power of two great forces of nature – the Sun and the Wind.

I have always tried to promote the increase in the Wind Power generation capacity in Gujarat through successive policy frameworks. As a result of this, there has been a phenomenal rise in Gujarat's Wind power generation. From 119.495 MW in 2002, it increased to 3,387 MW in 2014. These Wind farms have generated 24,493 million units of electricity over the last eight years. This has helped emission reduction equivalent to 5.46 million tCO_2.

The tables below give the year on year capacity addition of Wind Power to the State as of March 31st, 2014 and the growth of Wind Power over the years compared to the total Power Capacity of the State. Wind power contributes to 12.25% of the total power generated in Gujarat, as against the national average of 6.82%.

While the percentage growth of Wind Power in Gujarat during 2003 to 2014 is 1,771 %, at National level it has been 794% for the same period.

Year on Year Addition

Year	Capacity addition, (MW)	Cumulative capacity (MW)
2006-07	284	569
2007-08	616	1,185
2008-09	314	1,499
2009-10	298	1,797
2010-11	313	2,109
2011-12	790	2,899
2012-13	208	3,108
2013-14	280	3,387
TOTAL		**3,387**

Growth of Wind Power Generation

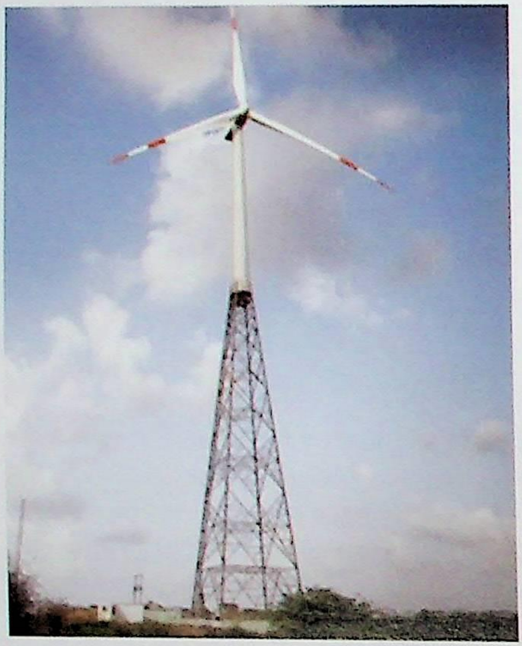
Year	India / Gujarat	Total Power Installed Capacity (MW)	Wind Power Capacity installed, (MW)	Wind Power as % of Total Capacity	% Increase in Capacity compared to 2003		% Increase in Capacity compared to 2008	
					Total	Wind	Total	Wind
2003	India	107,877	1,871	1.73				
	Gujarat	8,606	181	2.1				
2008	India	143,061	8,698	6.08	32.61	364.89		
	Gujarat	9,841	1,255	12.75	14.35	593.37		
2014	India	245,258	16,733	6.82	127.35	794.33	71.44	92.38
	Gujarat	27,647	3,387	12.25	221.25	1,771.27	180.94	169.88

In July 2013, we announced the new Wind Power Policy to tap the enormous Wind Power Potential of Gujarat to generate environment friendly energy and reduce the use of fossil fuel.

In June 2014, the State witnessed innovation and pioneering work in the sector of Wind Power Development by installing World's first 120 meter high Hybrid Wind Tower design for a 2.1 MW Wind Turbine generator in Kutch district. The hybrid tower is a combination of Lattice and Tubular structure and is primarily designed for low wind sites, besides being logistics friendly and cost effective.

Increasing the hub height for higher energy yields has been one of the critical focus areas for all major Wind Turbine Generator (WTG) manufacturers.

The State has paved the way for the replication of this innovation for cost effective, energy efficient and higher Wind Power generation.



World's First Hybrid Tower for Wind Turbine,
Kutch, Gujarat

Hybrid Tower for Wind Turbine Generator

- Commissioned in June -2014
- Latest evolutionary - tallest Hybrid Tower (120 m)
- Combination of lattice and tubular tower
- Increased hub height for higher yield
- 30 % saving in foundation concrete
- Logistics friendly

The investor friendly policies for Renewable Power generation in the State, have resulted in MoUs with private investors for setting up of 9,984 MW Wind Power Plants in the State during Vibrant Gujarat Global Investors' Summits in 2011 and 2013 at Gandhinagar.

Renewable Energy at Vibrant Gujarat Global Investors' Summit – 2011 and 2013

- Vibrant Gujarat Global Investors' Summit is a biennial event organized in the State of Gujarat to provide platform to the Investors / Project Developers to interact with the top Government officers for possible investment in the State in accordance with various promotional policies of the Government.
- With the special incentive package announced for Solar and Wind Power Projects, the Renewable Energy Sector received a boost during Vibrant Gujarat Global Investors' Summits in 2011 and 2013.
- Over 220 MoU in the sector of Renewable Energy were inked during the two Summits held in 2011 and 2013.
- These 220 MoUs covered a wide spectrum of Projects in the area of creating manufacturing facilities for Solar Photovoltaic components; setting up of Power Projects based on Solar, Wind, Biomass, Sea Waves, Geothermal, Municipal solid and liquid wastes; LED Manufacturing etc.
- These MoUs envisaged an investment of over US $ 19 billion over the years.

Solar Energy

With high Solar radiation levels for almost 300 days in a year, Gujarat has vast potential for Solar Power Generation Projects.

I am proud to share that Gujarat was the first State to announce a Megawatt scale Solar Policy way back in 2009. It is also important to understand that solar energy was not a mainstream subject in India up till 2009. Its deployment was highly scattered in small projects all over the country and the Central as well as many State Governments were examining the possibility to scale up this green technology to meet their objectives. The drivers were many, including (i) developing a new and potentially vast technology for energy generation to reduce the country's energy deficit, (ii) striving towards energy security for the country (iii) reducing greenhouse gas emissions for a cleaner environment.

The governments were examining the model that the rest of the world was following which was to connect the solar energy power plants to national electricity grid. Hence, the Government of Gujarat launched the Gujarat Solar Power Policy-2009. This policy not only targeted a solar installation capacity of 500 MW by the year 2014 but also had many well-designed investor-friendly provisions.

Solar Park,
Charanka, Gujarat

Against the set target of 500 MW, by the end of March 2014, the State registered an installed capacity of 891 MW which increased to 1,015 MW by the end of March 2015, including the World's first 1 MW Canal Top Solar Power Plant in Mehsana district; 10 MW Canal Top Solar Power Project on the Narmada canal at Vadodara and over 335 MW Solar Power Plants at a single location at the Solar Park, Charanka.

Solar Park, Charanka, Gujarat

We learnt early during the consultation meetings with developers about the challenges involved in acquiring large areas of land required for solar projects. Individual solar projects in Gujarat ranged from 1 to 40 megawatts wherein the land requirement was anywhere from 4 to 7 acres per megawatt. Hence, we decided to establish a 'Solar Park', a unique concept where it would establish and provide developers with the required amount of land and basic infrastructure such as road connectivity, electrical evacuation facility, water, drainage and various other soft services. Most of this land, located near a remote village called Charanka in the outskirts of Patan district was Government's wasteland. The private farmlands purchased there were also barren and couldn't be used for agriculture. The area earmarked for the Park was about 2,500 acres with an infrastructure to host multiple solar power plants aggregating to 500 megawatts. Not only was the concept of the Solar Park idealistic, but more breathtaking was the fact that within a short time span of 13 months from laying of the foundation stone emerged an entire infrastructure guided by government agencies in parallel with 21 individual solar projects totaling to 214 megawatts resulting in Asia's largest Solar Park- which as of March-2015 has an installed capacity of 345 MW.

Once a faceless area, today the villages around the Solar Park thrive with hope and activities. The annual electricity generation from the Solar Plants in Gujarat is more than twice the nationally mandated requirement towards fulfillment of the Renewable Purchase Obligation of the State. These initial bold steps taken by us in promoting solar power on a large scale have led to development of competitive solar power that is speedily approaching grid parity.

World's First Solar Canal Top

Canal Top Solar Power- Birth of an Innovative Concept

- Generates clean and green power, strengthening energy security and mitigating huge amounts of carbon emissions.
- Generates power at the doorsteps of the farmers, thus reducing transmission losses and strengthening the grid.
- Generates power with even higher efficiency compared to terrestrial solar power plants due to cooling effect on solar arrays by the canal water.
- Saves 1,280,000 kg of CO_2 emission per year.
- Saves land that would otherwise be used to house the solar arrays.
- Reduces water loss from evaporation by shading them with solar arrays.
- Retards the growth of algae in the canal water

Replicating the 1 MW Canal top Solar Power Project, a 10 MW Canal Top Solar Power Plant at Vadodara was inaugurated by the Secretary-General, United Nations, Ban Ki-moon, in January, 2015.

Secretary-General, United Nations Inaugurates the 10 MW Canal Top Solar Power Plant, Vadodara, Gujarat.

10 MW Canal Top at Vadodara

- Canal Length : 3.25 km
- Top Width: 22.10 meter
- Plant Capacity: 10 MW
- Annual generation: 18 million Units
- Captive Use of Power
- Annual Savings: US $ 1.86 million
- Land Use avoided: 20 ha.

Solar Cities- Gandhinagar, Surat and Rajkot

Urbanization and economic development are leading to a rapid rise in energy demand in urban areas in our country as a result Greenhouse Gas (GHG) emissions have also increased.

Many cities around the world are setting solar targets and introducing polices for promoting renewable energy to reduce GHG emissions.

Several Indian cities and towns are experiencing rapid growth in the peak electricity demand. The local governments and the electricity utilities are finding it difficult to cope with this rapid rise in demand and as a result most of the cities/towns are facing electricity shortages.

The Solar City aims for a minimum of 10% reduction in projected demand of conventional energy at the end of five years, through a combination of enhancing supply from renewable energy sources in the city and energy efficiency measures.

Solar City – Gandhinagar

Project	Nos.	kW	Annual Savings, '000 kWh
Solar Power Projects, kW	2	2,000	3,200
Grid tied Roof Top for sale to Utility, kW	385	4,600	7,360
Grid tied Roof Top for Captive Use, kW	46	1,960	2,800
Wind Solar Hybrid for Captive Use, kW	6	60	87
Solar Power Packs at Residences, kW	127	127	13.9
Solar Street Lights- Roads, Parks, kW	125	22	10
Solar Water Heaters at Residences, LPD	210	52,500	393
Solar Water Heaters at Institutes, LPD	4	15,000	113
Energy Efficient Tube Lights, T-5, kW	14,000	392	818
CFL Bulbs, kW	8,000	160	
TOTAL			**15,144**

Carbon Emission Reduced : 15,144 Tons, Coal Avoided: 10,430 Tons

Source: Gujarat Energy Development Agency, 2014

Our basic aim is to motivate the local governments to adopt renewable energy technologies and energy efficiency measures. In a Solar City all types of renewable energy based projects like solar, wind, biomass, small hydro, waste to energy etc. may be installed along with possible energy efficiency measures depending on the need and respurces availability in the city.

In this context, in early 2007, I had given the concept of "Development of Solar Cities" and to begin with Gandhinagar was announced to be made as the First Solar City of the Country. Today, Gandhinagar, the capital of Gujarat uses 2% of its energy from Renewable sources. And it is intended to be taken to 10%.

The experiment at Gandhinagar has led to launching of a scheme of Solar Cities in the Country by the Union Government and Gandhinagar has been declared as a model Solar City of the Country.

Gandhinagar Solar City was also the first city to launch Solar Roof Top Programme as early as 2008-09, starting with the Government office buildings for captive use of Solar Power followed by gross metering in Domestic/Commercial and Government sector.

Surat and Rajkot, two other major cities of the State have also marched ahead in becoming Solar Cities. The major initiatives taken by Surat and Rajkot are listed below:

Solar City- SURAT

- 11.40 MW Wind Power Plant for captive use of energy
- 270 kW Solar Power Plants for Captive Use.
- 3.5 MW Biogas based Power Plant
- 16 MW Municipal Solid Waste based Power Plant under construction
- Energy Audits of all Industries with electrical load of over 75 kW

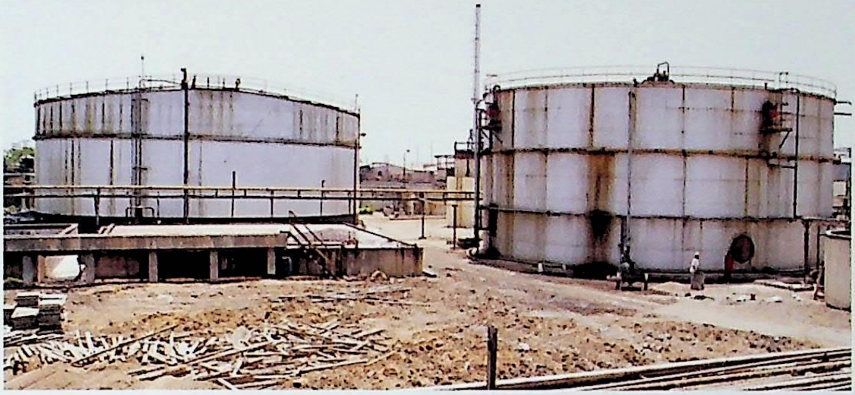
Solar City- RAJKOT

- Energy Park set up in the heart of the City and LED Street Lighting.
- 120 kW Solar Power Plants at the Corporation Office.
- Mandatory provision of Solar water heating System in all new buildings
- More than 30,000 solar water heaters have been installed in various establishments.

Gujarat Energy Development Agency (GEDA) Promotes:

- Devices based on Renewable Energy sources such as Improved Cook stoves, Solar Cookers, Solar Water heaters, Off Grid and Grid tied Solar Power Generation systems, Institutional Biogas Plants, Wind Resource Assessment, Water Pumping Windmills and Wind Turbines.
- Devices that save energy, such as Improved Crematoria, Natural Water Coolers, Diamond Hot Plate, Mono Block Lathe, T-5 tube-lights, LED lights and electronic accessories (ballasts, chokes, regulators), Improved electronic accessories, Improved Potters' Kiln and Potters' Wheel, Improved Bullock Cart.
- Demand Side Management for Agriculture Pump Sets.
- Energy Audit of public utilities.
- Energy Audit Study of water pumping stations and implementation of recommended measures.
- Energy Audit of designated consumers under the mandate of Government of Gujarat.
- Demonstration of Energy Efficient Street Lighting Systems by Urban Local Bodies.
- Biomass Gasifier based thermal and electrical power generation applications.
- Awareness Workshops and Training Programmes in Colleges, Schools and for Professionals.

20 kW Solar-Wind Hybrid System at GEDA, Gandhinagar



Waste - to - Energy Power Generation Project (Capacity - 2 MW)
Kanoria Chemicals,
Ankleshwar,
District Bharuch,
Gujarat

Child Energy Guardians (Bal Urja Rakshak Dal)

- I have always believed in the enormous, inherent power of children to facilitate change in social habits and practices. This inspired me to announce, in 2003, a unique scheme of 'Child Energy Guardians'. The aim was to mobilize children as energy guardians, to motivate responsible, rational and restrained use of energy in their homes, schools and community by encouraging right and honest choices. This pioneering experiment to create an energy-wise Gujarat has resulted in the following achievements:
- 'Child Energy Guardian' teams have been established in 3,600 schools (1,800 primary and 1,800 secondary schools).
- 50,000 children are enrolled every year and mobilized as Child Energy Guardians.

- Participatory awareness programmes have been conducted in urban, semi-urban, rural and tribal regions of the State with participation of over two million people.

- 1,800 'Energy Pioneers' have been identified and selected from amongst school teachers all over the State, who have undergone extensive training and sufficient hands-on experience at Science City in Ahmedabad to conduct energy audit in schools and homes.

- 9,000 home energy audits and 1,800 school energy audits have been conducted by the motivated 'Child Energy Guardians' Force.

- Edutainment (fun-and-learn) activities, such as puppet shows and other cultural events, have been specially designed and organized for school children to understand the basics of energy concepts, forms and types of energy and energy conservation practices at home and schools.

- The programme, as a participatory awareness generation module, has helped to reduce carbon footprints in Gujarat. This is because one kWh of energy saved is 4 kWh of energy generated.

coastal sustainable
livelihoods

Fishing Vessels at Veraval Harbour

District Junagadh, Gujarat

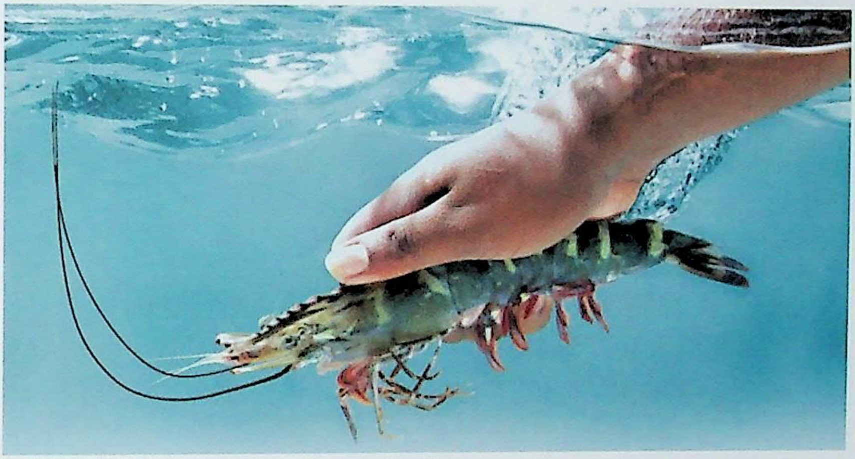
Integration of Climate Change adaptation into all aspects of policy formulation and implementation for poverty reduction has been one of the high priority areas for our government.

I personally feel that governments should focus more on broad and integrated development strategies to equip the poor and vulnerable people to withstand Climate shocks. Coastal Gujarat, having over 1,600 km exposure to Arabian sea, the longest exposure in India, will be more vulnerable to potential sea level rise, flooding, cyclones and damages to infrastructure.

It also houses a large fishing community. Therefore, in 2007 we devised a new integrated development programme for coastal communities known as 'Sagar Khedu Sarvangi Vikas Yojana' (Multi Dimensional Development Package for Coastal Communities).

This is a unique convergence model with an allocation of ₹ 110 billion* covering 38 sub-divisions of Gujarat coast and a population of around 6 million. It is for the first time that any Indian State has announced such a programme that addresses the specific problems and needs of people living in coastal areas. The programme goes beyond mere livelihood issues. Recognising the fact that people living in coastal areas play a distinctive role not only in the economy but in the preservation of eco-system, the programme takes a holistic and integrated view to address the needs of their livelihoods, keeping in mind the dignity of life. It proposes specific and time bound action plan for improving wage and self-employment, capacity building and skill upgradation, educational facilities, health infrastructure, drinking water, housing, salinity ingress, electrification and water conservation, development of salt pan workers and national security.

Aquaculture On Gujarat Coast

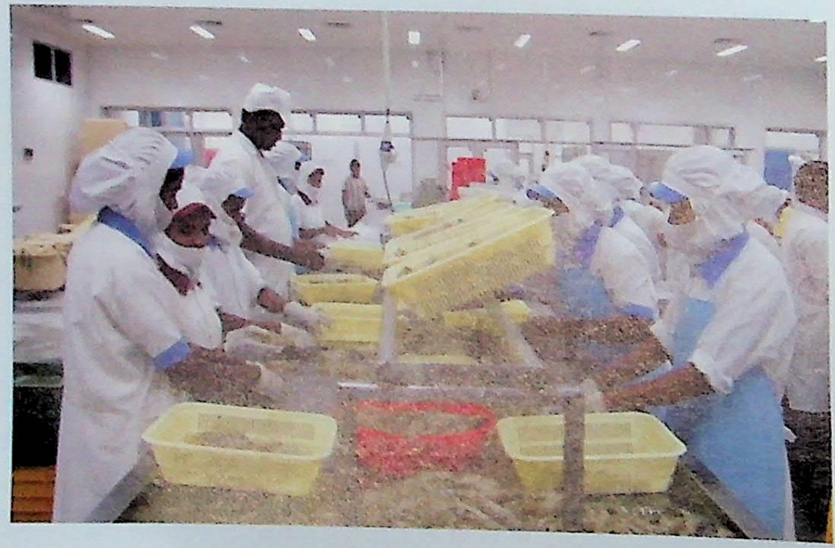


*1 US$ ≅ ₹ 64.2

12-Points of "Sagarkhedu Sarvangi Vikas Package"

(Multi Dimensional Development Package For Coastal Communities)

1. Skill Upgradation Programmes
2. Creating Employment Opportunities
3. Development through Education
4. Health Services for all
5. Access to Pure Drinking Water
6. Home for all
7. Soil Conservation
8. Water Management
9. Electrification
10. Capacity Building Programmes
11. Development of Salt Pan Workers ("Agarias")
12. National Security



Shrimps Grading at a Plant, Gujarat

Squids Processing at a Plant,
Gujarat

It has a special focus on the upgradation of technology in traditional professions like fishing as well as salt pan work. Strengthening internal security on the coastal line with the use of state-of-the-art technology in modernising 10 Police Stations, equipping the Police with new jeeps, motor cycles, computers and communication network at an expenditure of around ₹600 million* in the first phase and development of Police Stations with an outlay of ₹ 2,200 million* in the second phase is also a part of the plan.

Each of the 38 sub-divisions will get at least one Industrial Training Institute (ITI). Further, it will have special part time vocational training programmes in 14 trades pertaining to coastal areas. A special training is also proposed for marine technicians and marine engineering courses. Tourism activities would be initiated with a view to immediately increase related employment.

***1 US$ ≅ ₹ 64.2**

On the educational front, 88 new primary and secondary schools and 8 new polytechnics, which would cost approximately ₹ 2,000 million* are being planned. Naval National Cadet Corps courses would be offered in all the coastal educational institutions. The entire coastal belt will be given access to community and primary health centres along with qualitative improvement of the existing ones.

There is a major focus on nutrition of the children and pregnant mothers. Four new Primary Health Centres (PHCs) and 9 mobile health care units are being set up in addition to modernizing of Veraval General Hospital at a cost of ₹ 125

Students of Fisheries College
Veraval, Gujarat

Fisheries Training Programme
Veraval, Gujarat

million*. A part of the plan is to provide drinking water through surface pipelines to each of the 3,000 villages in coastal belt. Around 50 to 60 villages shall be provided drinking water through reverse osmosis process. Around 15,000 houses for poor people and 82,000 toilets will also be provided. A sum of ₹ 350 million* is being allocated for village infrastructure. A major programme of ₹2,000 million* is being undertaken for soil conservation to prevent salinity ingress by way of constructing tidal regulators, spreading canals, protection walls, checkdams, recharging of ground water and integrated watershed projects. In addition ₹ 480 million* have been provided for water conservation by way of constructing 600 checkdams and deepening of 600 village ponds. Around 125,000 km long electricity distribution service line will be renovated with anti-corrosive materials costing ₹ 450 million*. Apart from these 9 transmission sub-stations at a cost of ₹ 340 million* will be established in the coastal sub-divisions. There are about 40 villages where power would be provided with the help of solar energy.

There is a special package for the salt pan workers. This includes provision of clean drinking water, school rooms, medical mobile vans, protective kits, rationing mobile vans, rest sheds and community centres as also free uniform and educational kits for their children. This programme is being implemented with a strong resolve of our government with the hope of betterment of every individual in coastal areas.

Skill Upgradation in Coastal Belt

Expected Outcomes of Multi Dimensional Development Package for Coastal Communities

1. Creation of new job avenues will reduce the distress of frequent migration.

2. Upgradation of technical skills through an ITI in each sub-division will help educated youth to find productive employment.

3. Off-season employment for fishermen will be available.

4. Enhanced capacity of fishermen through training and modern equipment will augment fish production and thereby their standard of living.

5. Enhanced export avenues of various value added marine products will also be available.

6. Special package for Salt pan workers will improve the quality of life of salt pan workers at large.

7. Substantial check in salinity ingress would lead to better agricultural productivity and safe drinking water.

8. Adequate availability of basic amenities in rural households Coastal areas will reduce their vulnerability to Climate Shocks.

This is a historic package unparalleled in whole of India.

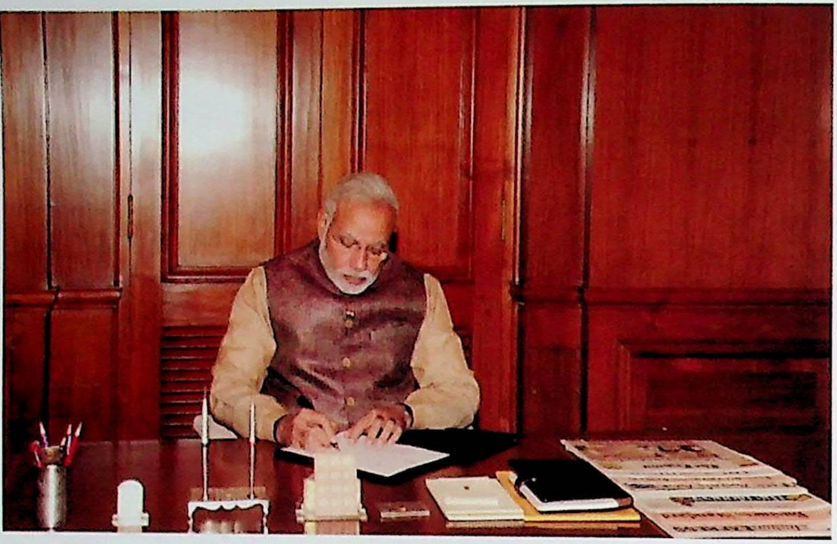
Disaster Preparedness in Coastal Areas

Gujarat State Disaster Management Authority (GSDMA) has taken many initiatives for disaster preparedness and risk reduction in coastal areas. GSDMA has prepared a comprehensive Hazard Risk and Vulnerability Atlas (HRVA) for the State covering six major hazards namely Earthquake, Tsunami, Flood, Cyclone, Drought and Chemical and Industrial hazards. One of the key objectives behind this is to create communities that are aware of the steps to be taken in a pre, during and post disaster situation to protect lives and property. The programme focuses on awareness generation, education, training, management and recovery at community, district and state levels.

Following initiatives have been taken up under the programme:

- Training of Trainers (TOT) for Cyclone Management and Flood Rescue have been organized in collaboration with Municipal Fire Departments and local NGOs.
- Hazard manuals for cyclone, earthquake, flood and industrial accidents have been developed and distributed to all the districts.
- In addition, leaflets and do's and don'ts along with safety tips for addressing cyclone, floods, earthquakes and other hazards have been developed and distributed during training programmes to all the district officials for further dissemination.
- Standard Operating Procedures (SOPs) and manuals for first aid, search and rescue and first aid pocket size booklets and handbooks have been distributed to different Disaster Management Teams.
- Gujarat Institute of Disaster Management (GIDM) also organises regular training programmes for district and grass root level officials, on cyclone and flood preparedness especially during the pre-monsoon season starting from May to July.

continuity for change



In the summer of the year 2014 the people of India bestowed upon me the august office of the Prime Minister of India. I am hopeful and confident in all humility that I shall live up to their expectation and shall serve Mother India to the best of my abilities.

National security, agriculture, industry, commerce, law and justice, education, health-care and other such like matters have hitherto been expressly projected to be our focal areas of governance. In addition to these and yet inextricably linked with them is the issue of climate change that needs to be taken up comprehensively. The impact of climate change on mankind has been increasing in alarming proportions over the past few decades. It has to be addressed now, and addressed effectively and meaningfully. India with her ancient and vibrant wisdom and vast resources – albeit partly untapped to some extent - has to come to grips with climate change and not only mitigate its impacts on her one billion plus people but also give the lead to other nations across the globe.

Since early childhood I have been conscious to the need to be in harmony with nature. I am steeped in Indian culture, pointed expression of which for respecting nature can be found in several Indian scriptures. This has been my fervent belief, as I have mentioned in earlier parts of this book. As Chief Minister of the State of Gujarat for around twelve years, I have had the opportunity to start treading such

balanced developmental path and to put to practice the aforesaid theory. The results have been very encouraging, I must declare, in all modesty. Gujarat has made significant strides towards adaptation and mitigation of Climate Change.

This chapter is a humble attempt to outline the beginning that has been made at the national level since May, 2014.

Climate Change and Environment

After taking over we ensured that Climate Change should not just be an implied subject or peripheral sphere of activity in the Union Government. Since its formation in 1985, till May 2014, the concerned Ministry has been the Ministry of Environment and Forest (MoEF). In order to give a thrust to issues pertaining to Climate Change we redefined the Ministry as the 'Ministry of Environment, Forest and Climate Change' (MoEF&CC) just the way I had done in Gujarat by setting up a separate and dedicated Department of Climate Change under the Government of Gujarat.

The redefining was intended to signal to the global community India's renewed commitment to challenges of Climate Change and readiness for taking a leadership role. Following are the major initiatives taken with respect to climate change and environment:

- Prime Minister's Council on Climate Change (PMCCC): To drive domestic action on climate change the Prime Minister's Council on Climate Change (PMCCC) has been reconstituted by us. Taking into account the need of the hour, PMCCC decided to enhance the ambition of all national missions under National Action Plan on Climate Change (NAPCC) in respect of Adaptation, Mitigation and Capacity building. PMCCC also recommended development of new missions in the light of new scientific evidence and technological advances related to Wind Energy, Health, Waste-to -Energy conversion and Coastal management. Like the Solar Mission, the Wind Mission will be housed in the Ministry of New and Renewable Energy. PMCCC has included a new Mission on Climate Change and Health. A National Expert Group on Climate Change and Health has been subsequently constituted by Ministry of Health and Family Welfare to address the issues related to adverse effects of Climate Change on human health through appropriate mitigation and adaptation measures. The waste-to-energy mission will incentivise efforts towards harnessing energy from waste and is again aimed at lowering India's dependence on coal, oil and gas, for power production. Our government, through the "Swachh Bharat Mission," under the Ministry of Urban Development, has provided support for up to 20 percent of project costs linked Viability Gap Funding for waste processing technologies.

- Green India Mission (GIM): National Mission for a Green India aims to use a combination of adaptation and mitigation measures for enhancing carbon sinks in sustainably managed forests and other ecosystems, adaptation of vulnerable species/ecosystems, and adaptation of forest-dependent communities. For this in 2014, GIM implementation guidelines were finalized and circulated. To further synergise these efforts and to collectively address the climate change concerns, we have come out with convergence guidelines after consulting both Environment and Rural Development Ministries. Convergence of GIM guidelines with Mahatma Gandhi National Rural employment Guarantee Scheme (MGNREGS) and Compensatory Afforestation Fund Management and Planning Authority (CAMPA) is done. For implementation in the States, perspective plans are being received and reviewed. In order to assist the State governments, The National Remote Sensing Centre (NRSC) has developed "Bhuvan" (a software application to explore 2D / 3D representation of earth's surface) enabled decision support system for the States.

- National Mission on Coastal Areas (NMCA): NMCA is being developed taking cognizance of the scientific evidence highlighting the vulnerability of coastal areas to climate induced severe storms, winds and waves, sea surface temperature rise, ocean acidification, extreme events, freshwater input. MoEF&CC, which already regulates activities along India's coasts through the Coastal Regulation Zone (CRZ) notification 2011, will house and service this Mission.

- Himalayan Ecosystem: The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) addresses important issues concerning Himalayan Glaciers and the associated hydrological consequences, biodiversity and wildlife conservation and protection, traditional knowledge societies and their livelihood and planning for sustaining of the Himalayan Ecosystem. We have also launched National Mission on Himalayan Studies to complement NMSHE with the objective of building a body of scientific and traditional knowledge along with demonstrating replicable solutions to the problems in thematic areas including natural resource management, capacity building, long-term ecological monitoring etc.

- National Designated Authority (NDA): NDA for Green Climate Fund (GCF) was established in 2014. Anchored in Ministry of Environment, Forest & Climate Change, NDA is the core interface between the country and GCF and its role is to ensure that activities supported by the Fund align with strategic national objectives and priorities. A National Designated Entity (NDE) for Technology Mechanism was also established in 2015.

- COP20: The Indian delegation led by my Union Minister of MoEFCC, Mr. Prakash Javadekar, attended the Conference of Parties (COP) 20 and meeting of the Parties (CMP) 10 under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol that was held in Lima, Peru from 1-14 December, 2014. The team played a proactive and constructive role in protecting India's long term interests and emphasised the need for inclusive growth and development space to tackle the issues like poverty eradication, providing energy access to all, and address other developmental priorities. India along with other developing countries was able to ensure that the decisions adopted incorporated the convention principles and the rights of developing countries to pursue inclusive and sustainable development.

- Research Studies: To strengthen the scientific base on climate change, MoEF&CC is supporting various studies on climate change. At present, three studies are being undertaken on (a) GHG trajectory till 2100 (b) legal form of 2015 Agreement and (c) Equity & differentiation. A new National Institute for Climate Change Studies and Actions (NICCSA) is also being set up by Climate Change Action Programme (CCAP) of the MoEF&CC. The Institute will conduct analytical studies on scientific, environmental, economic development and technological issues related to climate change.

- Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+): In accordance with the Cancun Agreements under UNFCCC, developing countries willing to undertake REDD+ activities are required to formulate and follow a national strategy or action plan, establish a national forest reference emission level, a robust and transparent national forest monitoring system for the measurement, reporting and verification (MRV) on the performance of the REDD+ activities, and a system for providing information on how the REDD+ safeguards are being addressed. In this regard and to guide the country in supporting REDD+, an Expert Committee was constituted for the preparation of Reference Document on REDD+ in India.

The Reference Document for REDD+ in India was released in December 2014 as a guidance document to channelize the actions of all relevant stakeholders for an effective implementation of REDD+ in the country. The Reference Document comprehensively addresses the need of capacity building across all levels of the government, expert organizations, civil society, other organizations and local communities. Important aspects of National Forest Monitoring System comprising MRV and Safeguards Information systems have been dealt with lucidly in the document. The document will also help to prepare projects for financial support from Green Climate Fund (GCF) and other bilateral sources for REDD+ activities.

- Control of Pollution: New stringent rules and standards are being introduced for pollution control and abetment. Rising temperatures can aggravate the challenge of air pollution. Gathering information is often the first step towards preparing for climate change related threats and we have taken several measures in this regard. The most noteworthy initiative is the launch of National Air Quality Index (AQI). Traditionally, air quality information has been reported through voluminous data, which often does not make much sense to the general public. However, I believe it is important that information on air quality is put up in public domain in simple linguistic terms for easy understanding. In view of this, CPCB was asked to initiate steps for developing National AQI as a tool for effective dissemination of air quality information.

  AQI scheme was launched on October 17, 2014 for inviting public comments. AQI scheme comprises of six categories, namely Good, Satisfactory, Moderately polluted, Poor, very Poor, and Severe with different colour codes. It considers eight pollutants (PM10, PM2.5, NO_2, SO_2, CO, O_3, NH_3, and Pb) for which short-term (up to 24-hourly averaging period) National Ambient Air Quality Standards are prescribed. Based on the measured ambient concentrations, corresponding standards and likely health impact, a sub-index is calculated for each of these pollutants. Information on likely health impacts for these categories is also provided.

AQI is expected to result in greater awareness and larger involvement in air quality improvement. It will help citizens in taking preventive measures and will assist local government agencies and pollution control authorities in taking mitigation measures.

The Fly Ash Utilisation Policy makes it mandatory to use only fly ash/ fly ash based products in construction of buildings, roads and reclamation / compaction of land within a radius of 100 km from a coal or lignite based thermal power plant, thus displacing the cement use. It also mandates utilisation of Fly Ash for backfilling or stowing of the mines.

Climate Change and Energy

Energy is a vital input for production and growth. Considering universal energy access and energy security as one of the fundamental development goals for the country, we have undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in carbon emissions. On the generation side, we are promoting greater use of renewables in the energy mix mainly through solar and wind power and shifting towards supercritical technologies for coal based power plants. On the demand side, efforts are being made to efficiently use energy through various innovative policy measures under the overall ambit of Energy Conservation Act. We undertook a number of initiatives since May, 2014 in power sector in order to maintain the balance of country's development with that of environment stability:

- Thrust is given to add more coal-fired thermal generating stations based on supercritical technology. A capacity of 8925 MW coal-fired generating stations based on Supercritical technology has been commissioned. These stations are more efficient than Sub-critical units and emit less CO_2.

- Renovation and Modernisation (R&M) and Life Extension (LE) of existing old power stations is being undertaken in a phased manner. About 144 old thermal stations have been assigned mandatory targets for improving energy efficiency. A capacity of 62.5 MW of old inefficient thermal unit has been retired.To facilitate State Utilities/Power Plants to replace old inefficient coal based thermal units with supercritical units, the Ministry of Coal has formulated a policy on automatic transfer of Letter of Authorization (LoA)/Coal linkage (granted to old plants) to new plants of nearest super-critical capacity.

- A capacity of 287.3 MW of clean hydro power plants has been commissioned.
- Coal cess has been increased from ₹100/- per ton to ₹ 200/- per ton to enhance National Clean Energy Fund (NCEF) that is utilized for promoting clean electricity production.
- As the penetration of more efficient variable speed air conditioners has increased, a voluntary labelling program for variable speed air conditioners has been launched on June 29, 2015.
- Bureau of Energy Efficiency (BEE) developed the "Design Guidelines for Energy-efficient Multi-storey Residential Buildings for Composite and Hot-dry Climates" in order to include passive design features. The Design Guidelines were launched on 2nd September, 2014.
- Zero Effect, Zero Defect (ZED): The Make in India campaign with ZED is a policy initiative to rate Medium & Small Industries on quality control and certification for energy efficiency, enhanced resources efficiency, pollution control, use of renewable energy, waste management etc. using ZED Maturity Assessment Model. The scheme launched in 2015, envisages coverage of about 1 million medium and small enterprises.

- India is promoting Nuclear Power as a safe, environmentally benign and economically viable source to meet the increasing electricity needs of the country. With a 2.2% share in current installed capacity, total installed capacity of nuclear power in operation is 5780 MW. Additionally six reactors with an installed capacity of 4300 MW are at different stages of commissioning and construction. Efforts are being made to achieve 63 GW installed capacity by the year 2032, if supply of fuel is ensured.

- A LED based Domestic Efficient Lighting Programme (DELP) and LED based Street Lighting National Programme (SLNP) have been launched to promote efficient use of energy in the lighting sector. The programme is targeting replacement of 770 million LED residential lights and 35 million street lights in next three years. Further, the Bureau of Energy Efficiency (BEE) has expanded the labelling program to include Omni-directional LED lamps on 6th July, 2015.

National Programme for LED-based Home and Street Lighting

बिजली बचाओ
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National Programmes for
LED Street Lightin... LED Home Lighting
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EFFICIENCY
PRIME MINISTER

India through its two programmes focused on Street Lighting and Domestic Lighting has ambitious plans to replace all incandescent lamps with Light-emitting diode (LED) bulbs in the next few years leading to energy savings of upto 100 billion kilowatt hours (kWh) annually. Through DELP the consumer will get a high quality LED Bulb at 1/3rd the market price and electricity bill will reduce by about ₹160-400* per year with each LED, thus making the cost recovery within a year. This initiative will also lead to savings in electricity and lower consumption of fossil fuels thus benefiting the environment. Till October 2015, more than 21 million LED bulbs have been distributed that collectively will result in emissions saving of 0.81 million tCO_2 annually.

***1 US$ ≅ ₹ 64.2**

Minimizing Transmission Losses

In order to reduce transmission losses we have approved the 'Integrated Power Development Scheme' (IPDS). The earlier scheme of Restructured Accelerated Power Development and Reforms Programme (R-APDRP) has been subsumed in the new IPDS. The objectives are as follows:

I. Strengthening of sub-transmission and distribution network in the urban areas

ii. Metering of distribution transformers/feeders/consumers in the urban areas.

iii. Ongoing work of R-APDRP to be completed.

The scheme will help in reduction in aggregate technical & commercial (AT&C) losses, establishment of IT enabled energy accounting / auditing system, improvement in billed energy based on metered consumption and improvement in collection efficiency. All distribution companies (DISCOMS) including private sector DISCOMS will be eligible for financial assistance under the scheme.

Smart Grid

Smart Grid facilitates efficient and reliable end-to-end intelligent two-way delivery system from source to sink through integration of renewable energy sources, smart transmission and distribution. Smart Grid also enables real time monitoring and control of power system as well as helps in reduction of AT&C losses, demand response and demand side management, power quality management, outage management, smart home energy system etc.

India needs smart grid without any further delay due to the following reasons:

1. Increased load needs as one of the World's fastest growing economies and to avoid frequent power cuts.
2. Drive to electrify a large segment of our rural population.
3. The need to optimize electrical usage by being able to manage loads and enhance the operating efficiencies.

To make the concept of Smart Grid a reality following decisions have been taken :

I. 14 Smart Grid Pilot projects and one Smart City Pilot Project of IIT Kanpur have been sanctioned at an estimated cost of about US $ 62 million out of which 50% grant (about ₹ 2 billion) is being provided by the government. Out of the 14 pilot projects, 6 pilot projects of APDCL (Assam), UHBVNL (Haryana), HPSEBL (Himachal Pradesh), CESC (Karnataka), PSPCL (Punjab) and WBSEDCL (West Bengal) have already been awarded and project of UGVCL (Gujarat) is under awarding stage. The other projects are under tender /evaluation stages.

ii. To further promote the Smart Grid in the country, we have launched the 'National Smart Grid Mission (NSGM)' on 27th March, 2015 for planning, monitoring and implementing policies and programme related to smart grid in India. Under NSGM, 30% funding would be provided for development of smart grid in Smart Cities and micro grid in the Country. Smart Grid Knowledge Centre shall also be developed for development of technical manpower, capacity building & suggesting curriculum changes in technical education etc. The total estimated cost for NSGM activities for 12th plan is US $ 152 million including a budgetary support of US $ 52 million.

CO_2/GHG Displacement through Power Sector Initiatives

Initiatives (new and ongoing programmes)	**Estimated Emission Reduction in Million Tonnes of CO_2 (compared to 2005 level) Year 2020**
Standards & Labelling programme for air conditioners (S & L Programme)	4.45
Implementation of Energy Conservation Building Code (ECBC) in Commercial Buildings (and Residential buildings during the period 2020-30)	31.45
Perform Achieve and Trade (PAT)- Reducing the specific energy consumption (SEC) of the Cement, Steel, Fertilizers and Pulp & Paper sectors	45.57
Deployment of LEDs for reducing energy consumption in lighting	38.05
Use of Super-Critical Technology in Thermal Power Projects	13.72
Addition of Hydro capacity	71.1
Generation Obligation for Thermal Power Stations (proposed in the Electricity Act Amendment)(renewable energy)	11.81
Total	**216.15**

Source: Ministry of Power, Government of India, 2015

Renewable Energy

Renewable energy sources are a strategic national resource. Harnessing these sources will put India on the path to a cleaner environment, energy independence, and a stronger economy. Renewable energy technologies contribute to better air quality, reduce reliance on fossil fuels and curb global warming, add good jobs to the economy and protect environmental values such as habitat and water quality. In Gujarat I had promoted renewable energy to a great extent and now at the national level I have been aiming to replicate the same.

There has been a visible impact of renewable energy in the Indian energy scenario, taking the share of renewable energy to 12.96 % in the national electricity installed capacity. Renewable energy based decentralized and distributed applications have also benefited millions of people in Indian villages by meeting their cooking, lighting and other energy needs in an environment friendly manner.

Since May, 2014 the Ministry for New and Renewable Energy has taken a number of steps to accelerate development and deployment of renewable energy in the country. Major among these are as follows :

Targets for Renewable Energy Capacity Addition Up-scaled : India is running one of the largest renewable capacity expansion programs in the world. The targets are significantly scaled up with the aim to achieve 175 GW renewable energy capacity in the next few years. India has also decided to anchor a global solar alliance, InSPA (International Agency for Solar Policy & Application), of all countries located between the Tropic of Cancer and the Tropic of Capricorn.

Sources	Installed capacity at the end of 11th Plan (2007-12)	Capacity addition Targets for 12th Plan (2012-17)	Revised Targets for 2022
	Capacities in MW		
Solar Power	941	10,000	100,000
Wind Power	17,352	15,000	60,000
Small Hydro	3,395	2,100	10,000
Biomass Power	3,225	2,900	5,000
Total	**24,914**	**30,000**	**175,000**

Source: Ministry of New & Renewable Energy, Government of India, 2015

Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects : Following the model of Solar Park of Charanka, Gujarat, on 10th December, 2014 we approved a scheme for setting up 25 Solar Parks, each with a capacity of 500 MW. Ultra Mega Solar Power Projects are also to be developed in next 5 years in various States. These parks will be able to accommodate over 20 GW of solar power projects.

Tax Free Bonds for Renewable Energy : The Ministry of Finance has accorded in-principle approval for issuance of tax free infrastructure bond of US $ 778 million for funding renewable energy projects during the year 2015-16.

Priority sector lending status for renewable energy : The Reserve Bank of India (RBI) has notified (23/04/2015) that banks can now provide loans up to a limit of US $ 2.3 million to borrowers for solar, biomass, wind, and micro-hydel power generation. The renewable energy based public utilities like street lighting systems and remote village electrification are also covered under the Priority Sector lending. In addition, individual households can avail upto US $ 15,575 for renewable energy projects under priority sector lending norms.

National Clean Energy Fund (NCEF) grant for renewable power evacuation : An amount of US $ 630 million has been approved by our government, as financial support for creation of intra state transmission system for evacuation of renewable power, under the National Clean Energy Fund. This would benefit the States of Tamil Nadu, Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra and Rajasthan.

National Clean Energy Fund (NCEF) grant for 3 schemes under 100 GW solar scale up plan : The Inter Ministerial Group of my Cabinet, in its 30th April, 2015 meeting has recommended US $ 778 million each for the following three schemes:-

i. Setting up of 5000 MW of Grid Connected Solar PV Power Projects with Viability Gap Funding (VGF) under Batch I of Phase –II of Jawaharlal Nehru National Solar Mission (JNNSM);

ii. Grid Connected Rooftop and Small Power Plants Programme; and

iii. Decentralized Generation of Renewable Energy (with special emphasis on benefits to unemployed youth and Farmers).

Incentive grant for Renewable Power : In line with the recommendations of the 13th Finance Commission, the Ministry of Finance, on 16th March, 2015 released US $ 778 million to States as incentives grant for development of renewable energy. The incentive grant is an additional resource at the States disposal for creation of infrastructure for renewables, particularly to address the challenges confronting speedy deployment of renewable energy technology in the country.

Setting up of over 300 MW of Grid-Connected Solar PV Power Projects by Defence establishments and Para Military Forces with viability gap funding : Under this Scheme over 300 MW of Grid-Connected and Off-Grid Solar PV Power Projects will be set up by Defence Establishments under the Ministry of Defence and Para Military Forces in five years during 2014 to 2019.

Implementation of Scheme for setting up 1GW of Grid Connected Solar PV Power projects by Central Public sector Undertakings (PSUs) and Government of India (GoI) organizations with viability gap funding : We have also approved the Scheme for setting up of 1GW of Grid-Connected Solar PV Power Projects with VGF support of US $ 155 million, by CPSU under various Central/State Schemes, in three years period from 2015-16 to 2017-18.

New Green Building of MoEF&CC, New Delhi

Scheme for Development of Grid Connected Solar PV Power Plants on Canal Banks and Canal Tops : MNRE has adopted Gujarat's initiative of Canal Top Solar Power Plant-first in the World. Based on this we have launched a scheme for Development of Grid Connected Solar PV Power Plants of an aggregate 100 MW solar PV capacity on Canal Banks and Canal Tops in the country during the 12th Plan period at an estimated cost of US $ 151 million and with an assistance of US $ 35 million.

Restoration of Accelerated Depreciation (AD) Benefits to Wind Power Projects : Significant harm was caused to the wind sector due to withdrawal of AD with effect from 01/04/2012; this has been restored on 18/07/2014. This decision will help in creating a robust manufacturing base for wind turbines in the country.

Scaling up of a programme of Solar Pumps : The existing programme of Solar Pumps has been scaled up to reach 100,000 solar pumps and supplementary guidelines for this have been issued.

Classification of Renewable Projects from Red to Green Category : On the request of MNRE, Ministry of Environment, Forest and Climate Change has decided that classification of Solar, Wind and Small Hydro Projects should be removed from Red Category and now be placed in Green Category under Central and State Pollution Control Boards.

Improved Cook-stoves : Unnat Chulha Abhiyan Programme with the objectives to develop and deploy improved cook-stoves for providing cleaner cooking energy solutions in rural, semi – urban and urban areas using biomass as fuel for cooking has been launched.

Setting up a JVC for undertaking the First Demonstration Offshore Wind Power Project in the country along the Gujarat Coast : An MoU was signed on 1st October, 2014 for setting up a Joint Venture Company (JVC) to undertake first Demonstration Offshore Wind Power Project in the country along the Gujarat coast.

The Ministry of New and Renewable Energy has assessed the carbon displacement capability of renewable energy technologies up to the year 2022. The renewable power target of 175 GW by 2022 will result in abatement of 326.22 million tons of CO_2 eq./year.

[1]Assumptions: In calculating CO_2 abatement, the following PLF has been considered – Biomass (0.60), Wind (0.20), small hydro (0.40), waste to energy (0.60), solar (0.19). 0.98 tCO_2 is emitted per MWh of electricity from coal based power units.

Climate Change and Green Transport

In the endeavor towards a low carbon economy, we are focusing on low carbon infrastructure and public transport systems like Dedicated Freight Corridors and energy efficient railways to reduce their environmental impact.

- Indian Railways handles 3 million tonnes of freight and 23 million passengers daily and is the world's third largest network. The endeavor is to increase the share of Railways in total land transportation from 36% to 45%, thereby decreasing the load on less efficient diesel operated road traffic.
- Dedicated Freight Corridors (DFCs) have been introduced across the country. In the first phase, two corridors viz. 1520 km Mumbai-Delhi (Western Dedicated Freight Corridor) and 1856 km Ludhiana-Dankuni (Eastern Dedicated Freight Corridor) are being constructed. The project is expected to reduce emissions by about 457 million ton CO_2 over a 30 year period. Indian Railways is also installing solar power on its land and roof tops of coaches.
- Recognizing its fuel efficiency, environmental friendliness and cost effectiveness, we are promoting growth of Coastal Shipping and Inland Water Transport. To enhance

the inland waterways transport, we have announced the implementation of Jal Marg Vikas for capacity augmentation of National Water Way-1. It is also proposed to establish integrated Waterways transportation grid with a view to connecting all existing and proposed National waterways with road, rail and ports connectivity. Another initiative in this direction is the Sagarmala Project with the objective to augment port-led development and promote efficient transportation of goods. Bharatmala Project which envisions constructing about 5,000 km of road network all along the coastal areas will further provide connectivity to these ports.

- The vision of Urban Transport policies is to focus on moving 'people' rather than 'vehicles', in which Mass Rapid Transit System (MRTS) would play an important role. Around 236 km of metro rail have been made operational in the country. Further, about 550 km are under construction and 600 km under consideration for different cities across the country including Ahmedabad, Pune, and Lucknow. Moreover, metro rail is being planned in fifty cities. Delhi Metro, which has become India's first MRTS project to earn carbon credits, has the potential to reduce about 0.57 million tonnes of CO_2 annually. Delhi Metro has also initiated installation of 9 solar power generation facilities and plans to increase their number.
- The mass-transit and urban transport projects initiated under the National Urban Renewal Mission also have positive climate change impacts in the long-run. About 39 urban transport and mass rapid transport projects have been approved and about 19 projects have been completed so far.
- Solar powered toll plazas have been envisaged by us as a mandatory requirement for toll collection across the country.

- We have recently formulated Green Highways (Plantation & Maintenance) Policy to develop 140,000 km long "tree-line" with plantation along both sides of national highways. 1% of total civil cost of projects is to be set aside to implement the policy.
- With a view to facilitating international commuting by highways, we have approved signing of the Bangladesh, Bhutan, India and Nepal (BBIN) Motor Vehicle Agreement to promote safe, economical efficient and environmentally sound road transport in the sub-region and support regional integration.
- Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME India) is a scheme formulated as part of the National Electric Mobility Mission Plan 2020 (NEMMP) to promote faster adoption and manufacturing of hybrid and electric vehicles in the country by providing incentives.
- Average fuel consumption standards for cars have been issued on 23rd February, 2015. The fuel consumption standards would be effective from 2017-18 onwards. A more stringent second set of standards would come into force from 2022-23. It is expected that these standards would lead to a reduction of 22.97 million tons of fuel consumption by 2025.
- National Policy on Biofuels has adopted an aspirational target of 20% blending of biofuels, both for bio-diesel and bio-ethanol. The government also launched the National Bio-diesel Mission identifying *Jatropha curcas* as the most suitable tree-borne oilseed for bio-diesel production. With the intention of further promoting biofuels, India has begun consultations on allowing 5% blending of biofuels in diesel that would be consumed by bulk users such as the railways and defence establishments.

Climate Change and Agriculture

Agriculture is the source of livelihood for nearly two-thirds of the population in India. It is predominantly rainfed covering about 60% of the country's net sown area and accounts for 40% of the total food production. Droughts and floods are frequent and the sector is already facing high degree of climate variability. The performance of agriculture sector has a direct bearing on food supplies and food security. India is projected to become the most populated country by 2030 and will need to produce an additional 100 million tonnes of food grains to feed the large population. In the agriculture sector, the need for comprehensive risk management and insurance is further enhanced due to these reasons. In Gujarat we achieved highest agricultural growth in the country by a multi pronged approach ranging from massive micro watershed management programme to developing climate resilient seed varieties. To better prepare and equip country's farmers to deal with the consequences of global warming and at the same time to also ensure higher agricultural productivity for establishing food security in India, we have embarked upon following initiatives in the agriculture sector:

Parmparagat Krishi Vikas Yojana (PKVY)
(Traditional Agricultural Development Scheme)

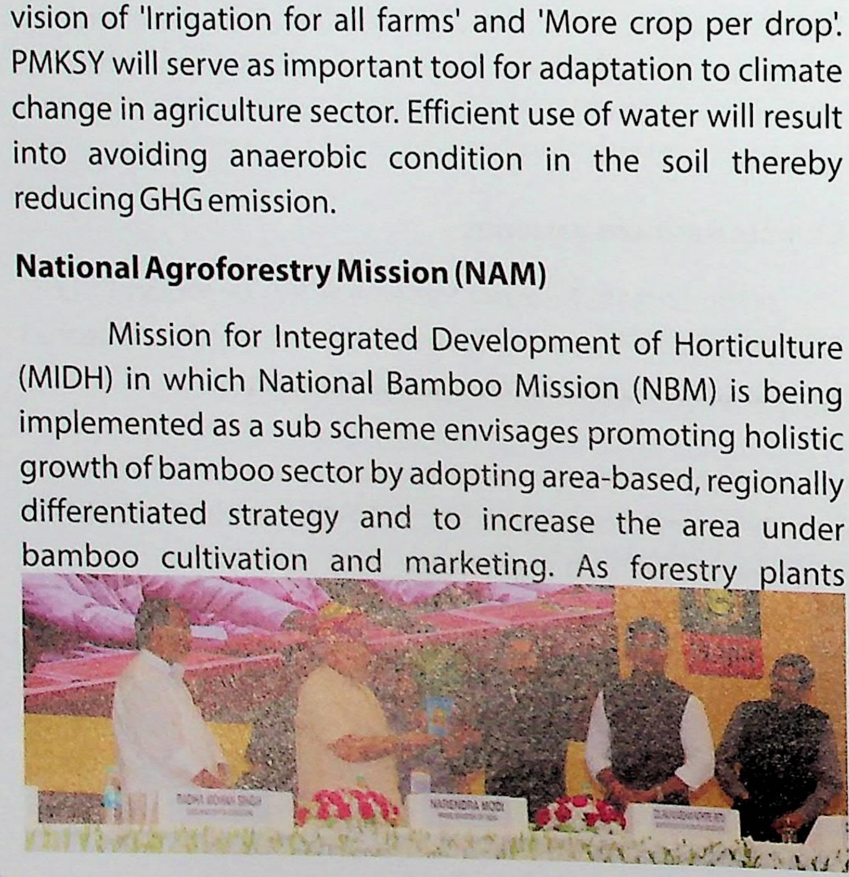
In 2015, we launched the Paramparagat Krishi Vikas Yojana (PKVY) scheme that envisages organic production without the use of chemical fertilizers and pesticides. Under PKVY organic farming is promoted through adoption of organic village by cluster approach & Participatory Guarantee System Certification (PGS Certification). Organic fertilization compared to mineral fertilization increases soil organic carbon and thus, sequesters larger amount of CO_2 from the atmosphere in the soil resulting in reduction of greenhouse gas (GHG) emissions coupled with additional benefit of increasing / sustaining soil biodiversity and other environmental services.

Pradhan Mantri Krishi Sinchai Yojana (PMKSY) (Prime Minister's Irrigation Scheme)

With the objective of extending the irrigation coverage to a larger area 'Pradhan Mantri Krishi Sinchayee Yojana' (PMKSY) scheme has been formulated amalgamating ongoing schemes in the areas of source creation, watershed development, rain water harvesting, micro irrigation etc. to focus on end-to-end solutions in irrigation supply chain right from source to field application under one platform with the vision of 'Irrigation for all farms' and 'More crop per drop'. PMKSY will serve as important tool for adaptation to climate change in agriculture sector. Efficient use of water will result into avoiding anaerobic condition in the soil thereby reducing GHG emission.

National Agroforestry Mission (NAM)

Mission for Integrated Development of Horticulture (MIDH) in which National Bamboo Mission (NBM) is being implemented as a sub scheme envisages promoting holistic growth of bamboo sector by adopting area-based, regionally differentiated strategy and to increase the area under bamboo cultivation and marketing. As forestry plants



contribute significantly towards carbon sequestration, the scheme is extended for growing other timber species in farmlands under initiatives of National Agroforestry Mission. This will not only increase the forest cover and increase carbon sequestration but also fulfil one of the aims of the National Agroforestry Policy 2014.

Soil Health Card (SHC)

We have made a Centrally Sponsored Scheme "Soil Health Card (SHC)" operational from the year 2014-15 to improve soil health, balanced /efficient use of fertilizer based on soil tests. Under the scheme Soil Health Cards will be provided to all farmers in the country in a period of three years. Based on the recommendations on SHC, chemical fertilizer will be used judiciously resulting in improvement in nutrient use efficiency, improved soil structure besides reduction in GHG emission and contamination of ground water.

Climate Resilient Varieties

106 Climate Resilient Varieties (CRV) by Indian Council for Agricultural Research (ICAR) have been Identified/Released for adaptation to the climate change challenges.

In addition to above initiatives, following Mission/Schemes have been restructured and launched by us during 2014-15 to address climate change issues:

National Mission for Sustainable Agriculture (NMSA)

NMSA as a programmatic intervention has been made operational from the year 2014-15. It aims at making agriculture more productive, sustainable, and remunerative and climate resilient by promoting location specific

integrated/composite farming systems; soil and moisture conservation measures; comprehensive soil health management; efficient water management practices and mainstreaming rain-fed technologies. During the 12th Five Year Plan, these measures have been embedded and mainstreamed onto ongoing/proposed Missions/ Progammes/ Schemes of Department of Agriculture & Cooperation (DAC) through a process of restructuring and convergence.

Rashtriya Krishi Vikas Yojana (RKVY) (National Agricultural Development Scheme)

The scheme provides sufficient flexibility to the states to develop and pursue the agricultural programme on the basis of their regional priorities. Stress has been given in

Climate Change and Rural Livelihoods

The rural areas are highly prone to stress and pressures from natural resource exploitation. In this context, schemes for rural development and livelihood programmes are very relevant. The Mahatma Gandhi National Rural Employment Guarantee Scheme in India (MGNREGS), with a budgetary annual allocation of about ₹ 347 billion (US$ 5.5 billion) in 2015-16, aims at enhancing livelihood in the rural areas. A vast majority of works under this programme aim at strengthening natural resource base of the rural economy and are linked to land, soil, and water.

infrastructure development which is a fundamental need for climate resilient sustainable agriculture, water harvesting, water management, reclamation of degraded land, soil health analysis, value addition, post harvest management, creation of storage facilities etc. which have strong adaptive potential to climate change.

National Food Security Mission (NFSM)

Additional components like location specific crop demonstration on cropping system suitable to agro-climatic zones with improved agronomic practices including direct seeded rice (DSR), system of rice intensification (SRI), crop diversification etc have been introduced since 2014-15 to address / upscale climate change related initiatives.

Mission for Integrated Development of Horticulture (MIDH)

Mission for Integrated Development of Horticulture (MIDH) focuses primarily on increasing both production and productivity through adoption of improved and appropriate technologies for ensuring quality, including genetic upgradation of all horticultural crops and addressing challenges of climate change. Special emphasis is being given for adoption of area based cluster approach towards developing regionally differentiated crops, which are agro-climatically most suitable for the State/region and having better adaptability to adverse climatic conditions.

National Mission on Agriculture Extension & Technologies (NAME&T)

To synergize extension mechanism NAME&T has been operational from 2014-15 providing extensive capacity building to farmers, scientists and extension workers at various levels on impact of climate change on agriculture, promotion of locally appropriate adaptation strategies, climate resilient practices etc.

Sub-Mission on Agricultural Mechanization (SMAM)

For expansion of scope and coverage of agricultural mechanization appropriate implements/farm machinery, providing higher level of support to users and promoting custom hiring is being undertaken in SMAM.

National Innovations on Climate Resilient Agriculture (NICRA)

The ICAR has up-scaled the demonstration of best practices through National Innovations on Climate Resilient Agriculture (NICRA) in 160 districts during 12th Five Year Plan. These practices cover four modules, i.e. Natural Resources Management, Crop production, Livestock & fisheries and Institutional interventions. The experiences of NICRA are to be used at large scale under NMSA.

National Mission on Oilseeds and Oil Palm (NMOOP)

NMOOP launched during 2014 envisages increasing production of vegetable oils from oilseeds, Oil Palm and Tree Borne Oilseeds (TBOs) under three Mini Missions (MM). To achieve the objectives, the mission is being implemented through inclusion of 23 oilseeds growing states The NMOOP through its various eco-friendly initiatives targets to indirectly contribute towards climate change adaptation and environmental sustainability by fixing nitrogen from atmosphere and improving soil quality.

Policies

Besides the initiatives mentioned earlier, some policy interventions are also made by our government in the agriculture sector. These are mentioned as under:

National Agro-forestry Policy- 2014 (NAP)

NAP has been approved by us to bring about coordination, convergence and synergy among various elements of agro-forestry scattered in various missions, programmes, schemes and agencies. Through horticulture/bund plantation/Agro-forestry, biomass is retained in the field for a relatively longer period and thus sequesters carbon both in above ground and below ground parts.

National Policy for Management of Crop Residues-2014 (NPMCR)

NPMCR focuses on the technological interventions for incorporation of crop residues into soil through promotion of conservation agriculture, diversified uses of crop residue, capacity building and awareness generation, laws and legislation to curb crop residue burning and monitoring for ensuring effective implementation of provisions of NPMCR. The crop residues that are typically burned in India are rice, wheat, cotton, maize, millet, sugarcane, jute, pulses, rapeseed-mustard and groundnut. NPMCR will check emission of Carbon Monoxide and Carbon Dioxide.

GHG Emission Reduction

Sr.	Intervention	Impact on GHG reduction
1	Improved practices in	
	i) Alternate wetting and drying/ Midseason correction in rice cultivation	30-35% reduction of CH_4 emissions over continuous flooding
	ii) Direct seeding of rice	70-75 % reduction of CH_4 emissions over traditional method of transplanting
	iii) Crop diversification (Rice to other cereal crops, such as maize)	90-100% reduction of CH_4 emissions over continuous Rice
	iv) SRI cultivation	61% reduction in CH_4 emissions over traditional method
2	Use of reduced tillage and nitrification inhibitors -	4.8% N_2O emission reductions through no tillage + nitrification inhibitor
3	Organic Farming Practices	48-66% emission reduction compare to conventional farming systems (Source: FAO)
4	Micro-irrigation	Emission reduction by Micro Irrigation (MI) from flood irrigation is 0.735 t of CO_2/ ha.
5	Horticulture plantation	Plantation absorbs about 1 t of Carbon/ ha annually
6	Ration balancing in milch animals	13.57 % decline in CH_4 emission

Source: Indian Council of Agricultural Research, Indian Agricultural Research Institute, National Dairy Research Institute, 2015.

Climate Change and Disaster Management

The Indian subcontinent is among the world's most disaster prone areas. Almost 85% of India's area is vulnerable to one or multiple hazard. 23 States and Union Territories covering 45.64 million hectares of land are subject to floods, and are prone to flood disasters. India's annual average flood damage during the period 1996-2005 was ₹ 47.45 billion (US$ 753.2 million)

India has been able to establish a holistic disaster risk reduction and response apparatus at national, state and district levels with the aim of reducing existing levels of vulnerability, prevention, and mitigation of disasters and also to provide appropriate response, rehabilitation and reconstruction. Strategies include early warnings and communications, construction and sustainable maintenance of multi-purpose cyclone shelter, improved access and evacuation, enhanced capacity and capability of local communities to respond to disaster and strengthening disaster risk mitigation capacity at central, state and local levels

The link between Adaptation, Disaster Risk Reduction and Loss and Damage is important. It has been witnessed that the occurrence of flash floods, extreme weather events, droughts etc. has increased in frequency and become more unpredictable. The Sendai Framework for Disaster Risk Reduction has laid down a road map for required response. There is an urgent need for finance to undertake activities for early warning system, disaster risk reduction, loss and damage and capacity building at all levels. The indigenous locally appropriate knowledge and technology may also be used for the purpose.

Climate Change and Health

Climate change will increase health related stress from extreme weather-related disasters such as wider spread of vector-borne diseases as malaria and dengue and increasing frequency of heat and cold waves.

We are now formulating a 'Health Mission' under the ambit of NAPCC to evolve strategies for mitigating, containing and managing the adverse impact of Climate Change on health. The mission aims at analysing epidemiological data, identify vulnerable population and regions, build knowledge base and expertise, increase awareness and community participation.

Climate Change and Water

Water enables life and is crucial for both human society as well as natural ecosystems. However, as a matter of fact water is one of the hardest hit sectors by climate change. Climate Change induced impacts on water availability due to recession of glaciers, decrease in rainfall and increased flooding in certain pockets would threaten food security, cause dieback of natural ecosystems including species that sustain the livelihood of rural households, and adversely impact the coastal system due to sea-level rise and increased extreme events. The scientific predictions of Climate Change impacts profoundly suggest that timely adaptation measures for Climate Change must be taken in the water sector.

The Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR,RD&GR) has identified 21 R&D projects covering all the river basins of the country for examination and impact of climate change on surface and ground water. Studies include basin-wise assessment of 21 basins as also studies related to downscaling circulation models/regional models to basin scales. Out of the proposed 21 studies, 10 studies (9 river basin studies and 1 downscaling studies) have been recommended by Indian National Committee on Climate Change. Eight study proposals (7 river basin impact studies on climate change and 1 research proposal on statistical downscaling) have been revised by the Research Institutes and submitted to National Institute of Hydrology (NIH)/R&D Division for necessary approval of the Ministry. The NIH/R&D, Directorate of MoWR, RD & GR is the co-ordinating agency. It is estimated that downscaling exercise will take one year, and impact study will be completed in three years. The mechanism of climate change mitigation and adaptation measures would be possible after the reports of these studies are available.

MoWR, RD & GR is implementing a National Project on Aquifer Management (NAQUIM) programme to undertake country wide aquifer mapping to achieve community based management of aquifers covering about 889,000 sq. km. during the 12th Five Year Plan for which CCEA approval of US $ 528.19 million has been accorded. Under this scheme, aquifers mapping being carried out in various parts of the country in priority areas like over-exploited, critical, coastal, urban and hilly areas. Preparation of geological maps for about 152,600 sq. km. has been achieved at the end of June, 2015. About 52,817 samples for water quality parameters - analysis for major ions, heavy metals and general parameters etc. through various tests have been undertaken. Further 1,461 exploratory wells have been drilled for obtaining subsurface aquifer disposition till July, 2015. The outcome of the NAQUIM project is expected to result in better water management particularly in ground water stressed area (dark, critical and semi-critical blocks) and the areas where there is Arsenic and Fluoride contamination problems.

National Water Mission

We have taken the following initiatives under the National Water Mission after May, 2014:

a. A Memorandum of Understanding (MoU) between National Water Mission (NWM) and National Institute Rural Development and Panchayati Raj (NIRD & PR) has been signed in Dec. 2014 for training & capacity building of multiple Stakeholders and Panchayati Raj Institution in the area of water conservation. NIRD & PR has initiated activities on training and capacity building of farmers, WUAs, Government officials, Panchayati Raj institutions and other stakeholders in the area of watershed management, water conservation, augmentation and preservation.

b. A Memorandum of Understanding (MoU) between National Water Mission (NWM) and Tata Institute of Social Sciences (TISS) has been signed in September, 2014 for undertaking activities related to promotion of citizen and state action for water conservation, augmentation and preservation. TISS will provide a framework for selection, accreditation and participation of NGOs in various activities related to water resources management, water conservation, preservation, capacity building and mass awareness programmes.

c. A scoping study for a National Water Use Efficiency Improvement Support Program for Major/Medium Irrigation Projects has been completed with technical assistance from Asian Development Bank (ADB). The report has been finalized and circulated to the State Governments and concerned organizations for taking necessary action.

d. Asian Development Bank (ADB) has completed Phase-I of the study "Operational Research to support mainstreaming of integrated flood management" with focus on non-structural measures. Two pilot studies have been initiated for Burhi Gandak in Bihar and Brahmani-Baitarani basin in Odisha.

e. MoWR, RD & GR has also launched Jal Kranti Abhiyan during 2015-16 which includes Jal Gram Yojana, development of Model Command Area, pollution abatement, mass awareness programme and other water conservation activities. Jal Kranti Abhiyan programme was organized in Jaipur, Shimla and Jhansi areas in the month of June, 2015. Jal Gram Yojana has a provision for selection of two water stressed villages in each district of the country.

Setting up of National Bureau of Water Use Efficiency (NBWUE)

MoWR, RD & GR has proposed to set up a National Bureau of Water Use Efficiency as an autonomous body under the Environment Protection Act 1986 with the objective to promote, regulate and control efficient use of water in agriculture, industrial, and domestic sectors in the country. The Draft Cabinet Note for setting up of NBWUE has been circulated for inter-Ministerial consultations in May, 2015.

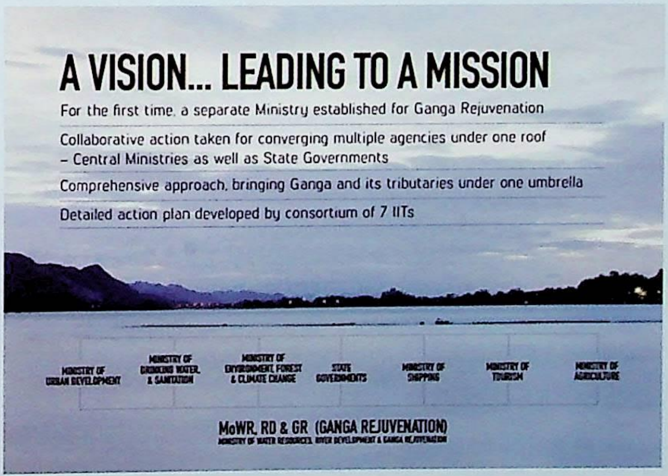
Repair, Renovation and Restoration (RRR) of water bodies

A scheme for Repair, Renovation and Restoration (RRR) of water bodies has been structured. It has multiple objectives like comprehensive improvement and restoration of water bodies thereby increasing tank storage capacity, ground water recharge, increased availability of drinking water, improvement in agriculture/horticulture productivity, improvement of catchment areas of tank commands, improved water use efficiency, promotion of conjunctive use of surface and ground water, community participation, development of tourism, cultural activities, etc. by providing Central assistance to State Governments. The scheme for implementation of RRR of Water Bodies in 12th Five Year Plan envisages taking up RRR works in 10,000 water bodies, 9,000 water bodies will be in rural areas and balance 1,000 water bodies will be in urban areas with an outlay of US $ 1.55 billion. The Empowered Committee (EC) of MoWR, RD & GR in its three meetings held during 2014-15 has cleared a total of 1,057 water bodies costing US $ 1.3 billion for restoration located in 8 States (Odisha – 760, Uttar Pradesh – 8, Meghalaya – 9, Uttrakhand – 5, Madhya Pradesh – 134, Tamil Nadu – 105, Rajasthan – 32 and Manipur – 4 water bodies). A total of US $ 16.11 million as Central Assistance (CA) has been released during 2014-15 for the works of 12th Plan Scheme as 1st instalment towards the RRR works of 898 water bodies of Odisha, Madhya Pradesh, Meghalaya and Manipur.

National Mission for Clean Ganga (NMCG)

An Integrated Ganga Conservation Mission has been set up by us. In addition a proposal has also been made for developments of Ghats and beautification of River Fronts at Kedarnath, Haridwar, Kanpur, Varanasi, Allahabad, Patna and Delhi in the current financial year.

- The principal objective of the project is to mainly focus upon ensuring "Aviral and Nirmal Dhara" of Ganga and ensuring its ecological and geological integrity;
- To reduce pollution loads in the River Ganga and its tributaries through implementation of pollution abatement schemes thereby improving the water quality. Through NMCG, the Central Government is assisting State Governments in creation of sewerage infrastructure and sewage treatment plants for reducing the pollution loads through point sources as Central Sector Scheme.
- To recognize the multi-sectoral, multi-disciplinary challenges of Ganga rejuvenation and need for having a collaboration of various departments, governments and stakeholders.



A VISION... LEADING TO A MISSION

For the first time, a separate Ministry established for Ganga Rejuvenation

Collaborative action taken for converging multiple agencies under one roof – Central Ministries as well as State Governments

Comprehensive approach, bringing Ganga and its tributaries under one umbrella

Detailed action plan developed by consortium of 7 IITs

MINISTRY OF URBAN DEVELOPMENT
MINISTRY OF DRINKING WATER & SANITATION
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
STATE GOVERNMENTS
MINISTRY OF SHIPPING
MINISTRY OF TOURISM
MINISTRY OF AGRICULTURE
MoWR, RD & GR (GANGA REJUVENATION)
MINISTRY OF WATER RESOURCES, RIVER DEVELOPMENT & GANGA REJUVENATION

Progress made under NMCG

- 77 Projects sanctioned at the cost of US $ 1.17 billion for creating treatment capacity of 708.23 MLD & Sewer network of 3,398.55 km.
- Sewage treatment capacity of 123 MLD & and sewer network of 626.36 km have already been created at the expenditure of US $ 180.71 million.
- Identification of 764 Grossly Polluting Industries (GPIs) through Pollution Assessment and Inventorization Scheme (PAIS). Out of 764 industries CPCB has completed inspection of 727 industries and issued directions under section 5 of Environmental Protection Act, 1986 to 200 GPIs & under section 18(1) (b) of the Water (Prevention & Control of Pollution) Act, 1974 to 200 units for not achieving discharge standards.
- Time bound action plan for online continuous monitoring system to be submitted by the GPIs.
- CPCB has issued directions to all SPCBs for achieving Zero Liquid Discharge for selected industries.
- Ganga Knowledge Centre has been set up at NMCG.
- Draft Ganga River basin Management Plan has been prepared and submitted by the Consortium of 7 IITs.
- National level meeting with industrial associations & representatives.
- Strategic communication plan developed in association with John Hopkins University.
- Clean Ganga Fund has been set up to encourage public participation & contribution.

Clean India Mission (Swachh Bharat Abhiyan)

To make the country clean, a purpose close to my heart, I launched the Swachh Bharat Mission on 2nd October, 2014. It has two sub-missions, namley the Swachh Bharat Mission (Rural) and the Swachh Bharat Mission (Urban), which aims to achieve Clean India by 2nd October 2019, as a fitting tribute to the 150th Birth Anniversary of Mahatma Gandhi. The overall targets to be achieved under Swachh Bharat Mission are:

- Household toilets for 10.40 million urban households;
- Construct 0.256 million public toilets;
- Construct 0.252 million community toilet seats; and
- Scientific disposal of Solid Waste in all 4,041 Urban Local bodies.

स्वच्छ भारत

एक कदम स्वच्छता की ओर

Mission Objectives:

- Elimination of open defecation
- Eradication of Manual Scavenging
- Modern and Scientific Municipal Solid Waste Management
- To effect behavioral change regarding healthy sanitation practices
- Generate awareness about sanitation and its linkage with public health
- Capacity Augmentation for ULBs
- To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

Swachh Bharat Abhiyan : The Key Points

The campaign is covering 4,041 cities and towns (ULBs) across the country with the aim to clean the streets, roads and infrastructure of the country. It also aims to address the issues of sanitation, waste disposal, open defecation, lack of toilets, manual scavenging etc. Government employees, students, politicians and celebrities have lent their support to the campaign.

Incentive for individual toilet has been increased to ₹ 12,000 (Including provision of ₹ 2000 for water availability) for all Below poverty Line (BPL) households and to identified Above poverty Line (APL) households (all SCs /STs, small and marginal farmers, landless labourers with homestead, physically handicapped and women-headed households). Allocation of US $ 9.65 billion has been made towards this mission, out of which GoI share will be US $ 2.27 billion.

For the first time, awareness generation through structured Information, Education and Communication (IEC) and Behaviour Change Communication (BCC) activities on solid waste management, sanitation under Clean India Mission are being taken up at massive scale at all levels. This will lead to community participation towards effective handling of solid/liquid waste, thereby eventually leading to a clean India and low carbon emissions.

Implementation Status

Population census 2011 has reported rural sanitation coverage of 32.7%. Further as per National Sample Survey Organisation (NSSO) 2012, 40.60% rural households have toilets. Rural Sanitation Coverage as on 31/07/2015 is 45.92% as per Online Monitoring System maintained by the Ministry.

Against the target for 2014-15 of 5 million for individual latrines, 5,854,987 latrines were constructed, which is achievement of 117% of the target. Besides, 1,109 Community Sanitary Complexes, 25,264 school toilets unit and 8,377 anganwadi toilets were constructed.

More importantly 4.949 million household latrines were constructed after the launch of Swachh Bharat Mission (Rural), indicating more than 446% increase in construction of toilets after SBM(R) was launched as compared to pre-SBM period of 2014-15.

Against the yearly target of 12 million for individual latrines for the year 2015-16, as many as 2,147,385 latrines have been constructed as on 31/07/2015. Also as on July 31, 2015 around 7,095,990 number of household latrines have been constructed since the launch of SBM(R) on 2nd Oct, 2014.

Climate Change and Urban Development

Through the Ministry of Urban Development we have initiated the following programmes and missions to support our actions regarding climate change:

Smart Cities

On 25th June, 2015 we launched the Smart Cities Mission. This is for a period of five years (2015-16 to 2019-20). The key objective of Smart Cities Mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to smart outcomes and at the same time maintains environment sustainability. Through this mission we aim to provide smart infrastructure facilities in water supply, sewerage, solid waste management etc. in 100 selected cities. It focuses on construction of green buildings that will result into reduction of carbon emission. Following points were considered while preparing the framework of this mission:

- As the global population continues to grow at a steady pace, more and more people are moving to cities every single day. Experts predict the world's urban population will double by 2050 which means we're adding the equivalent of seven New Delhis to the planet every single year. Urban areas also contribute a higher share of GDP.

- In India, the urban population is currently 31% of the total population and it contributes over 60% of India's GDP. It is projected that urban India will contribute nearly 75% of the national GDP in the next 15 years. Cities are therefore referred to as the engines of economic growth.

- There is accordingly a crying need for the cities to get smarter to handle this large-scale urbanization and finding new ways to manage complexity, increase efficiency, reduce expenses, and improve quality of life.

- In this context we have decided on developing "100 Smart Cities" project in the country. This aims at modernising the existing mid-sized cities and developing satellite towns of larger cities.

Smart Cities - Transforming Life - Transforming India:

- Taking a major step in its bid to recast the country's urban landscape, we have cleared the "100 smart cities" project and a new urban renewal mission will augment the pace of building efficient urban infrastructure in Indian cities.

- The Union Cabinet approved Central Government spending worth US $ 15.26 billion under two new urban missions over the next five years. The Cabinet cleared the Smart Cities Mission — under which 100 smart cities would be built — and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) for 500 cities with outlays of US $ 7.47 billion and US $ 7.78 billion, respectively. Under the Smart Cities Mission, each selected city would get central assistance of US $ 15.57 million per year for five years.

- The aim of the mission is to more efficiently utilise available assets, resources and infrastructure to enhance quality of urban life and provide a clean and sustainable environment. There will be special emphasis on participation of citizens in prioritising and planning urban interventions.
- Cities to be developed will be selected through a 'City Challenge Competition' intended to ascertain their ability to achieve mission objectives.
- Each state will shortlist a number of smart city aspirants, which will prepare proposals for the Centre.
- All states will get at least one smart city. A special purpose vehicle will be created for each city to implement smart city action plan

E-Governance and Citizen Services:

1) Public Information, Grievance Redressal
2) Electronic Service Delivery
3) Citizen Engagement
4) Citizens – City's Eyes & Ears
5) Video Crime Monitoring

Waste Management

6) Waste to Energy and Fuel
7) Waste to Compost
8) Waste Water to be Treated
9) Recycling and Reduction of C&D Waste

Water Management

10) Smart Meters & Management
11) Leakage Identification, Preventive Maint.
12) Water Quality Monitoring

Energy Management

13) Smart Meters & Management
14) Renewable Sources of Energy
15) Energy Efficient and Green Buildings

Urban Mobility

16) Smart Parking
17) Intelligent Traffic Management
18) Integrated Multi-Modal Transport

Others

19) Tele-Medicine & Tele-Education
20) Incubation/Trade Facilitation Centers
21) Skill Development Centers

Mission Monitoring

National level-Apex Committee (AC) headed by Secretary

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State level-State level High Powered Steering Committee (HPSC) - chaired by the Chief Secretary

↓

City Level- CEO of the SPV is convener of the Smart City Forum.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

AMRUT was launched in June, 2015 for a period of five years (2015-16 to 2019-20). The purpose of this mission is:

(I) to ensure that every household has access to a tap with assured supply of water and a sewerage connection;

(ii) increase the amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and

(iii) reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling).

AMRUT aims to provide infrastructure facilities in water supply, sewerage and public transport facilities etc. in 500 selected cities. The fund available under the programme will be partially used to construct sewage treatment plants, thus the quantity of untreated waste water in urban area will reduce resulting into lowering of carbon emission.

Climate Change and Foreign Collaboration

We have been interacting with both developed and developing countries for cooperation in the field of Renewable Energy with the following two aims:

a. Learn and adapt technological advancements and best practices in policy and implementation from advanced countries; and

b. Share and exchange knowledge and expertise of Indian policy planners, scientists, Implementers and business community in the field of climate change with counterparts in foreign countries and establishing institutional linkages between institutions of India and other countries through bilateral / multilateral cooperation framework.

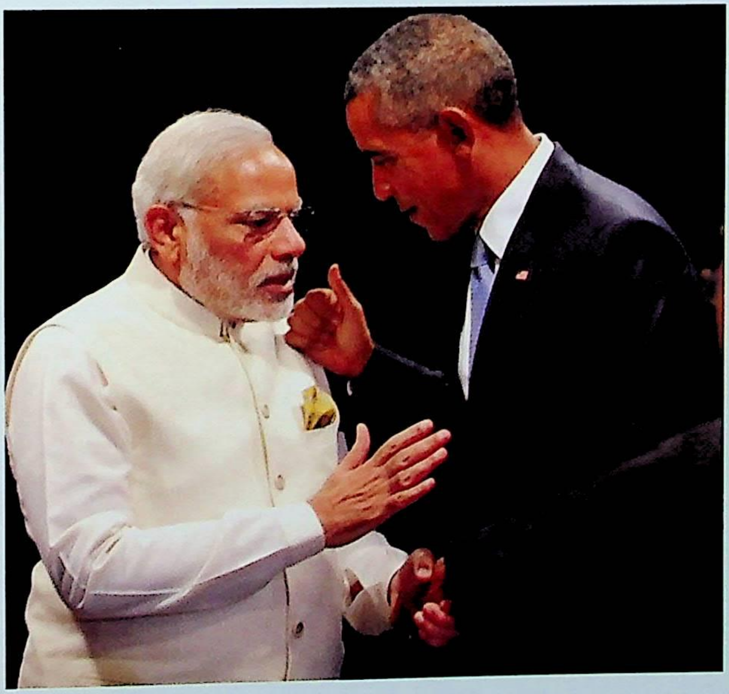
The details of the collaborations with various countries are below:

The United States of America

The United States of America and the Republic of India recognize that global climate change is a profound threat to humanity and to the imperatives of sustainable development, growth and the eradication of poverty. President Obama and I share a deep concern regarding climate challenge and understand that meeting it will require concerted action by our countries and the international community. We emphasized on the importance of enhancing our bilateral cooperation on adaptation measures, as well as joint research and development and technology innovation, adoption and diffusion for clean energy and efficiency solutions that will help achieve the goals of transitioning to a climate resilient and low carbon economy. We also highlighted the importance of working together and with other countries to conclude an ambitious climate agreement in Paris in 2015. To this end, it has been planned to cooperate closely. President Obama and I reaffirmed our prior understanding from September 2014 concerning the phase down of HFCs and agreed to cooperate on making concrete progress in the Montreal Protocol this year.

India and the United Stated of America are committed to working towards a successful outcome in Paris in 2015 of the conference of the UN Framework Convention on Climate Change (UNFCCC), including the creation of a new global agreement on climate change.

We recalled previous bilateral and multilateral statements on the phase-down of hydrofluorocarbons (HFCs) and recognized the need to use the institutions and expertise of the Montreal Protocol to reduce consumption and production of HFCs, while continuing to report and account for the quantities reduced under the UNFCCC. Pledge was taken to urgently arrange a meeting of the bilateral task force on HFCs prior to the next meeting of the Montreal Protocol to discuss issues such as safety, cost, and commercial access to new or alternative technologies to replace HFCs. Our countries would thereafter cooperate on next steps to tackle the challenge posed by HFCs to global warming.



Pacific Alliance

India is an Observer country in the Pacific Alliance (comprising of Chile, Colombia, Mexico and Peru as members). We have proposed collaboration with the Pacific Alliance in understanding ocean atmospheric interactions that are responsible for climate models such as El Nino Southern Oscillation and Indian Ocean Dipole and their association with Monsoon. Such a study will help enhance the weather and climate forecasting capability in both India and the Pacific Alliance countries.

Japan

Five working groups have been established under the India-Japan Energy Dialogue in the areas of: Electricity and Power Generation, Energy Efficiency, Coal, Renewable Energy and Petroleum and Natural Gas. New areas have been identified under Working Group on coal, including environmental monitoring, reclamation of mined out areas.

HIS EXCELLENCY NARENDRA MODI
PRIME MINISTER OF THE REPUBLIC OF INDIA
TO
THE REPUBLIC OF KOREA
MAY 18, 2015 SEOUL

Republic of Korea

When I visited Republic of Korea in May 2015, an MoU was concluded between the Ministry of Power of the Republic of India and the Ministry of Trade, Industry and Energy of the Republic of Korea concerning cooperation in the field of Electric Power Development and New Energy Industries. The MoU envisages cooperation in areas of electric power development and new energy industries such as renewable energy, smart grids and power information and technology, transmission and distribution of electric power, energy efficiency and storage system.

As per the Joint Statement released during the Korea visit, India and Korea have agreed to enhance exchanges for preservation of environment and clean energy. We have expressed willingness to work with Korea for mutually beneficial partnerships in deploying innovative policies and technologies to improve urban water and air quality and to protect natural resources.

China

During my visit to China in May 2015, for the first time, a separate Joint Statement on Climate Change was issued, along with the Joint Statement on bilateral relations, which shows the shared interest and importance that the two sides place on international climate change negotiations.

The two countries decided to further promote bilateral partnership on climate change and enhance the role of this partnership in our overall strategic cooperation partnership through the implementation of this Joint Statement.

India and China also decided to enhance high-level bilateral dialogue on domestic climate policies and multilateral negotiations and to further strengthen practical bilateral cooperation, including in areas of clean energy technologies, energy conservation, energy efficiency, renewable energy, sustainable transportation including electric vehicles, low-carbon urbanization and adaptation.

Mongolia

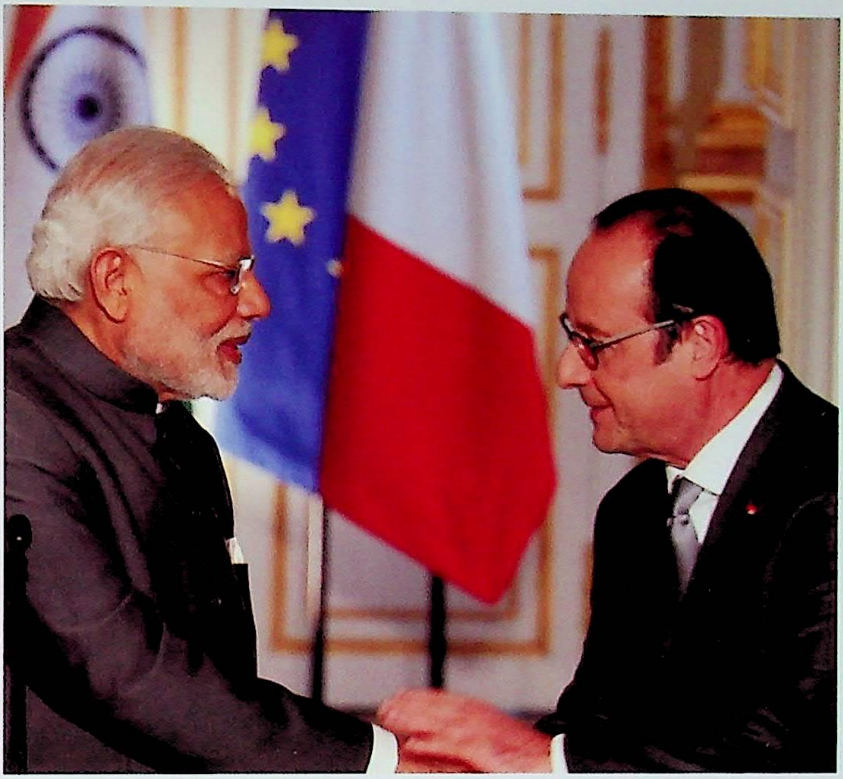
An MoU was concluded between the Ministry of New and Renewable Energy, India and the Ministry of Energy, Mongolia on Cooperation in the field of Renewable Energy during my visit to Mongolia in May, 2015.

Cooperation will include joint research, exchange and training of scientific personnel, exchange of information and data and transfer of know-how, equipment and technology on non-commercial basis.

Germany

Urban Development: A Joint Declaration of Intent (JDI) on Cooperation in Sustainable Urban Development has been signed with Germany in April, 2015. The JDI shall pave the way for cooperation in the area of urban planning, urban infrastructure and cooperation in smart cities. A JWG on Urban Development has been set-up under the JDI.

Renewable Energy: A Letter of Intent was signed during Hannover Messe on Indo-German Solar Energy Partnership. An MoU on the same subject has been signed during the visit of German Chancellor to India in October, 2015. Under the MoU, Germany will be offering financial and technical assistance of about Euro 1 billion for implementing Solar Rooftop, Solar Parks and Solar Off-grid Solutions in India.



France

Joint Statement issued in April, 2015 during my visit to France called for tackling the issue of Climate Change as below:

Climate Change: I extended my full support to France for a successful outcome of COP 21 to be held in Paris later this year. Confidence was expressed that the Paris Conference will finalize a historic agreement for the post 2020 period. This will further strengthen the efforts of the international community to address the profound challenge of climate change, to facilitate access to a low carbon pathway and resilient sustainable development for all whilst keeping the global temperature rise below 2°C. The French President, Francois Hollande and I underscored the importance of working together and with other countries to conclude an ambitious, comprehensive, universal, balanced and equitable climate agreement in Paris that will also encourage genuine technology, collaboration for adaptation and mitigation and financial support in meeting this common global challenge.

We also acknowledged the role of several voluntary international initiatives in complementing the multilateral climate action under the UNFCCC. In this context, we underlined the importance of enhancing Indo-French cooperation on joint research and development and technology innovation as well as diffusion of clean energy and efficiency solutions that will help in transitioning towards a climate resilient and low carbon economy.

Smart Cities: Smart Cities development is a key area to foster sustainable development solutions. France welcomes our offer to be a partner of the Smart cities development scheme of India and is ready to implement its best technological solutions and share its experience in the field of integrated sustainable cities, in particular in urban planning, urban grids, water and sanitation, sustainable mobility and digital technologies.

Renewable Energy: An MoU on cooperation in the field of renewable energy was signed during my visit between the Ministry of New and Renewable Energy (MNRE), Government of India and the Ministry of Ecology, Sustainable Development and Energy, Government of France, for exchange of know-how and joint research in the areas of solar, wind, bio-energy, tidal and wave energy sectors.

Sweden

The President of India, Mr. Pranab Mukherjee visited Sweden from 29 May – 2 June 2015 when, *inter alia,* an MoU was signed for pursuing bilateral cooperation in the field of Sustainable Urban Development. Further, during the discussions, 'Smart cities' was a focus area, with special thrust on Waste to Energy and sustainable development, including transport solutions and green energy.

Netherlands

A roadmap of cooperation was agreed between India and Netherlands in June, 2015 which included the following specific elements:

- Cooperation in Renewable Energy between Energy Research Centre of the Netherlands ECN, National Institute of Solar Energy (NISE) and Sardar Swaran Singh National Institute of Renewable Energy, including in biomass gasification technology and developing standards and specifications.
- 'Make in India' in Renewables, Solar and Biomass Sector with Dutch collaboration.
- Cooperation on Solar Road Project including solar photo voltaics and vibrations, in association with the Indian National Institute of Solar Energy.

Other Collaborations/ Cooperation

ASEAN-ML

I have ensured that the programmes and policies on cooperation with Association of South East Nation (ASEAN) region on climate change, mitigation and adaptation measures are given a boost and the ongoing programmes covering climate change and mitigation issues progress well. The project proposal 'Climate Change Projections and Assessment of Impacts: Modelling and Capacity Building Programme - India-ASEAN Region to assess the current climate change variability with respect to cropping season, rainfall, floods, droughts and temperature trends, using multiple models and multiple emission scenarios, including exchange of visits by scientists to share data; models and knowledge, worth US $ 710,000 was approved by the ASEAN Secretariat. The project would be funded through ASEAN-India Green Fund and led by IISc, Bangalore with participation of research institutes dealing with climate change from India and 10 ASEAN Member States. IISc, has identified partner institutes and lead scientists from respective countries.

An inception workshop on 'Enhancing Climate Change Adaptation in Southeast Asia' was held in Bangi, Malaysia on 5-6 February, 2015. The Inception Workshop comprised a capacity building session, a scene setting session and a focused discussion session to develop the terms of reference for the country scoping study. As of 5 May 2015, there are 6 National Partner Organizations that have been confirmed by their respective National Focal Points of the ASEAN Working Group on Climate Change (AWGCC). These are Singapore, Myanmar, Brunei, Vietnam, Indonesia and Thailand. The Workshop was attended by about 30 participants, who were representatives of the National Focal Points of the AWGCC and Partner Institutions and was funded under the US$ 5 million ASEAN-India Green Fund set up by India in 2011.

The other ongoing programmes on ASEAN-India interaction on Climate Change are 'Co-operation between ASEAN Centre for Biodiversity (ACB) and National Biodiversity Authority (NBA)' and 'The Indian Ocean Dipole Mode, El Nino Southern Oscillation (ENSO) and Monsoon Interaction and their Socio-Economic Impact on India-ASEAN Nations'.

SAARC

During the last South Asian Association for Regional Cooperation (SAARC) Summit, I announced setting up of India Endowment on Climate Change (IECC) in South Asia with a budget allocation of US $ 3.85 million grant. IECC can provide upto US $ 8 million per project for proposals from SAARC countries. Approved projects are intended to assist with adaptation, capacity building or mitigation objective in each country in the context of regional efforts to address Climate Change. Under this fund, so far, a grant assistance to the tune of US $ 8 million for installation of 70,000 Improved Cook Stoves in selected areas of Bangladesh has been approved.

The 46th Programming Committee of SAARC decided merger of 4 SAARC Regional Centres dealing with environment and disaster management into one Centre as SAARC Environment and Disaster Management Centre (SEDMC). We have offered to host the proposed SEDMC in India after EAM's approval. A Concept Note in this regard has been circulated among the SAARC countries and discussed during the 50th programming committee meeting of SAARC.

BIMSTEC

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Centre for Weather and Climate (BCWC) was launched at National Centre for Medium Range Weather Forecasting (NCMRWF) in Noida, India on March 28, 2014. BCWC organised a Training Workshop on "Improved Weather and Climate Predictions" from 26 August – 01 September, 2014. BCWC has also proposed to launch a Research Fellowship Programme through which young scientists from Meteorological Departments of member countries shall visit BCWC for short/long term research.

Working Together Towards
A Better Climate
The ABC of a meaningful dialogue

Today as the global community is working towards reaching consensus for enhanced action for tackling the challenge of climate change, we need to evolve a common understanding of everyone's requirement as well as responsibilities and put together ambitious initiatives for collective action. The cumulative accumulation of Greenhouse Gases (GHGs) historically since industrial revolution has resulted in the current problem of global warming. This is further compounded by the inadequate response of the developed countries even after the adoption of the United Nations Framework Convention on Climate Change (UNFCCC).

As the Convention and the Kyoto Protocol clearly delineated obligations and responsibilities, it was expected that all Annex - I nations would come forward with concrete strategy for implementation. By enhancing their efforts in keeping with historical responsibility, the developed and resource rich countries should have shared the burden of developing countries. Had we worked sincerely the situation would have been different at this time. But today, we face much higher 'emission' ambition gap. The critical issue before the non-Annex nations is the gap between their equitable share of the global carbon space and the actual share of carbon space that will be available to them. Many in the developed world feel that limiting the carbon space for the developing nations is an easy solution. This approach is naturally not acceptable to the developing world. It is in this context that transfer of technology and provision of adequate finance are crucial to together deal with the situation. This needs to be a substantial part of the fresh contributions of the Annex-I countries as also of the proposed global architecture so as to enable the developing countries to enhance their climate efforts. Without such means of implementation and resources, the global vision is but a day dream.

Today non-Annex nations face the challenges of achieving sustainable development goals (SDGs), ensuring dignified life to their teeming billions and yet responsibly moving towards a climate friendly developmental path. Their development plans will hopefully continue to have a balanced emphasis on economic development and environment. However, such an approach has additional costs, the impact of which can be alleviated either by financial or technological intervention. Hence, the Annex-I nations need to exhibit understanding of the challenges before a large section of the global population. Such understanding and commensurate action only would provide a flicker of hope as we strive to save our planet from the catastrophic impacts of climate change.

We do believe that India should be an active and constructive player in the search for solutions. In fact, India has a long tradition of harmonious co-existence between man and nature. We have always regarded fauna and flora as part of our existence. This is a part of our heritage and manifests in our lifestyle and work culture. Environmental sustainability, which involves both intra-generational and inter-generational equity, has been the approach of Indians for very long. It is because of this pro-environment tradition that our per capita emissions were only about 1.56 metric tonnes in 2010 estimates, while those of developed countries vary between 7 to15 metric tonnes.

Being the home to one sixth of humanity, India exemplifies the challenge of balancing the three dimensions of sustainable development - people, planet and prosperity. Eradicating poverty in all its forms is an indispensable requirement for sustainable development. National actions will necessarily need to address this development imperative; while at the same time, ensuring other social and environmental co-benefits. Hence, India is always committed to engage sincerely in multilateral negotiations under the Convention in a positive and creative manner.

Our objective is to establish an effective, forward-looking and equitable global architecture based on climate justice. This is the hallmark of the principles of equity and common but differentiated responsibilities and respective capabilities. We must promote sustainable production processes and inculcate sustainable lifestyles across the globe. Habit and attitude are as much a part of the solution as technology and finance. Hence, as we put together the new global compact for enhanced actions, it is critical to ensure that it is comprehensive, balanced, equitable, feasible and pragmatic. It should address all the elements including adaptation, mitigation, finance, technology transfer, capacity building and transparency of action and support. At the same time, the genuine requirements of developing countries for an equitable carbon and development space to achieve sustainable development and eradication of poverty needs to be safeguarded. Achievement of these goals looks possible only through adherence to the principles and provisions of the UNFCCC.

It is in this spirit of cooperation and environmental responsibility that India has put forward an ambitious climate action plan. Our Intended Nationally Determined Contributions (INDCs) were framed for adhering to the 1992 Convention; also we abided by the schedule for submission of our country's INDC document. Both in terms of cumulative global emissions (only 3%) and per capita emission (1.56 $tC0_2e$ in 2010), India's role to the problem of climate change is limited. But our intended actions are fairly ambitious. India's INDCs take into account the imperatives of addressing the National as well as global challenges.

India's INDCs are developed considering the fact that we are keen to attempt to work towards a low carbon emission pathway while simultaneously endeavoring to meet all the developmental challenges that the country faces today. India's approach is built upon its capabilities and future plans for inclusive growth which includes aspects like providing energy access to all, housing for all, other health and education related infrastructure, eradicating poverty etc. Ministry of Environment, Forest and Climate Change (MoEF&CC) adopted an inclusive process for preparation of India's INDCs. It held stakeholder consultations with the specific involvement of the key Ministries and State Governments. Interactions were also held with civil society organisations, think tanks and technical and academic institutions of eminence.

India's INDCs cover proposals on: Lifestyles; Cleaner Economic Development; Reduce Emission intensity of Gross Domestic Product (GDP); Increase the Share of Non Fossil Fuel Based Electricity; Enhancing Carbon Sink (Forests); Mobilizing Finance; and Technology Transfer and Capacity Building. I have ascertained that sustainable lifestyle and climate justice to protect the poor and vulnerable from adverse impacts of climate change are adequately emphasized in the INDC document. It also brings to the fore contribution of citizens and private sector in combating climate change.

Through these INDCs, India has shown its commitment to combat climate change and these actions are indeed important contributions to the global effort. Moreover, our recent decisions and actions testify this commitment towards quantum jump in our climate change actions. Starting with the massive scaling up of our Renewable Energy missions to the programmes on Smart Cities, Cleaning of Rivers, Clean India Mission (Swachh Bharat Mission), Green India Mission and Efficient Lighting require tremendous human effort and technological and financial resources. Even our emphasis on public transportation systems, levying of coal cess and reducing fossil fuel subsidies needed strong commitment to global cause. Through these decisions and initiatives, India has undertaken a massive shift towards greener growth. However, these efforts are also dependent on the availability and level of international financing and technology transfer since India faces complex developmental demands in other sectors.

We are seeking to build a global, equitable, inclusive, and ambitious agreement, with contributions from all countries so as to enhance implementation of the Convention. With submission of INDCs by 149 countries, the global community, including the developing world, has demonstrated their deep desire to combat climate change through bold plan of actions. The developed countries should provide leadership in these efforts. Climate justice demands that those most vulnerable are supported and enabled to fight the challenge of climate change. Hence we need the collective climate approach that is anchored in the wise words of Mahatma Gandhi - ***"Earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed".*** Let everyone prosper. Let every country develop. This is not antithetical to a better and safer climate if we take responsible actions. And our experience shows that creating a balance is not too inconvenient.

Climate Justice

I had chosen not to get involved in any figures, targets or quantities of emission cuts before embarking on a low carbon growth pathway for Gujarat. My objective had been an integrated strategy of development which makes sufficient allowance for global warming concerns. And after twelve years of practical experiences, results seem to justify the development we had adopted.

My deep conviction in the complementary and supplementary relationship between man and nature has been a renewable resource steering my mind to fight Climate Change. Dealing with Climate Change and protecting the earth for present and future generations is definitely a moral issue both justified in terms of universalistic moral ethics and also what Aristotle termed as 'Situational Ethics'. It is so because the urgency of the situation or, even what has been termed as 'planetary emergency' dictates ubiquitous adoption of this moral, if we use the famous Greek phillosopher's framework.

Climate discussions and deliberations have become an integral part of the international gatherings whether it be G8 meeting, Davos Economic Forum or any other gathering of developed and developing countries. It is disheartening to note that no overall consensus is emerging for reduction in emission. Given the constraints of politics and backstage lobbying of vested interests, the internationally binding outcomes have got delayed. But time is running out and with each passing month, year and decade the ecological debt of future generation is mounting higher and higher. In such a complex and fluid situation regional and state leaders in democracies (specially federal ones) have also a very significant role to play. From creating water and food security, sustainable coastal livelihoods to reducing emissions in transport, industry and creating an overall

Climate Change consciousness amongst children, students and other stakeholders; no electoral constraints or any other factors could inhibit our firm devotion to this cause. After having successfully pursued our growth model in Gujarat we have replicated it with far reaching consequences through the entire length and breadth of the country.

Finance and technology are in abundance all over the world. Recent financial crisis and huge recovery packages by all major nations have proved this fact. What is still lacking is strong political will to fight Climate Change and leave the globe still a habitable place for the future generations. I sincerely hope that this compilation of our diverse actions on Climate Change adaptation and mitigation would be a humble reminder to the world community of politicians, both in developing and developed worlds, that the divide between political cycle and carbon cycle can be filled by firm determination and resolute will. This might even set tone for collective action worldwide, even in absence of formal multilateral frameworks.

In retrospect, I feel satisfied that we have woven an appreciable safety net of adaptations by integrated policy frameworks. Our conscious adaptation, planning and creation of Climate defence infrastructure has resulted in increased resilience of rural and vulnerable communities against Climate shocks in the form of droughts, drinking water scarcity, excessive rains and flooding, etc. Transformational changes in my Government's practices and programmes have been felt and experienced at the grassroots and communities have willingly participated to increase their scope and coverage.

Whereas adaptation has a human angle and is more in the form of damage control exercise, mitigation has to be an essential component of a comprehensive Climate Change strategy. It should be clear from the various projects and efforts enumerated in the preceding pages that we have kept constant emphasis on mitigation initiatives.

I would suggest the readers of this book to pause for a moment and think about all that we take from nature in a day to live and then to realise that it does not ask for anything in return. That is what is known as true giving. Then let us not be too selfish to exploit nature mindlessly when the very foundations of our civilisation rest on the harmonious co-existence with nature.

Agenda 2030, with lofty vision and comprehensive goals is based on integrated understanding of social, economic and environmental linkages governing our lives. While these goals emphasize economic growth, industralisation, infrastructure and access to energy; climate change and sustainable consumption have been lent overall prominence.

Today, as one would see in preceding pages of this book; much of India's development agenda is mirrored in sustainable development goals. Vulnerability of poor to climate shocks far exceeds that of rich. Therefore, we in India, have resolved to focus more on climate justice by formulating policies and programmes leading to inclusive growth. Pradhan Mantri Jan Dhan Yojna (PMJDY) (Prime Minister's People Money Scheme) introduced in August, 2014 is a National Mission for Financial Inclusion to ensure access to financial services, namely Banking Savings & Deposit Accounts, Remittance, Credit, Insurance, and Pension in an affordable manner. With innovative usage of technology, 180 million accounts have been opened and $3.3 billion have been deposited signifying financial freedom of such a large number of account holders, duly certified by Guinness World Records. For providing institutional support for micro finance and help more than 120 million people we have launched Pradhan Mantri MUDRA (Micro Units Development and Refinance Agency) Yojana in April, 2015.

Without further enumeration of specifics my humble advice to the readers is to go through Sustainable Development Goals adopted on 25th September, 2015 and see how they have already been interwoven in the last chapter of this book which encompasses India's multipronged approach to deal with challenges of Climate Change.

India's intended Nationally Determined Contributions, which we carefully prepared, has been hailed as a step in the right direction and has given a clear cut signal of my government supporting the international process for achieving substantial success at COP21. I sincerely hope that investments in solar power, with our ambitious target, will bring reliable electricity additionally to millions of Indians on the one hand and reduce emissions on the other. While we reserve our right to develop our economy, our commitment to achieving low carbon goals remains unequivocal.

I hope that the developed world will fulfil its financing commitments for development and climate change, without putting both under the same head. There is no cause greater than shaping a world, in which every life that enters it can look to a future of security, opportunity and dignity; and where we leave our environment in better shape for the next generation.

In the end, let me express my hope for everyone's well being with a few lines from our ancient texts:

सर्वेभवन्तुसुखिनः, सर्वेसन्तुनिरामयाः ।
सर्वेभद्राणिपश्यन्तु,माकश्चिद्दुःखभाग्भवेत् ।

SarveBhavantuSukhinah
SarveSantuNir-Aamayaah |
SarveBhadraanniPashyantu
MaaKashcid-Duhkha-Bhaag-Bhavet |

"May all be happy,
may all be healthy,
may all see welfare,
may no one have any
sorrow."

Garur Puran (G. P.) 35.51

Narendra Modi

Abbreviations

ACB	ASEAN Centre for Biodiversity
AC	Apex Committee
Ad	Accelerated Depreciation
ADB	Asian Development Bank
AFB	Adaptation Fund Board
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
AMTS	Ahmedabad Municipal Transport Service
APDCL	Assam Power Distribution Company Limited
APL	Above Poverty Line
AQI	Air quality Index
ASEAN	Association of South East Asian
AT&C	Aggregate Technical & Commercial
AV	Atharva Veda
AWGCC	ASEAN Working Group on Climate Change
AWS	Agriculture Weather Station
BCC	Behaviour Change Communication
BCWC	BIMSTEC Centre for Weather and Climate
BEE	Bureau of Energy Efficiency
BIMSTEC	Bay of Bengal Initiative for Multi- Sectoral Technical and Economic Co operation
BOD	Bio Oxygen Demand
BPL	Below Poverty Line
BRTS	Bus Rapid Transit System
BS	Bharat Stage
C	Centigrade
CA	Central Assistance
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
Capex	Capital Expenditure
CBD	Central Business District
CBDR	Common but differentiated responsibilities
CCAP	Climate Change Action Programme

CCEA	Cabinet Committee for Economic Affairs
CCPP	Combined Cycle Power Plant
CDM	Clean Development Mechanism
CEA	Central Electrical Authority
CEPT	Centre for Environmental Planning and Technology
CER	Certified Emission Reduction
CES	Calcutta Electric Supply Corporation
CESC	Chamundeshwari Electricity Supply Corporation
CFL	Compact Fluorescent Lamp
CGD	City Gas Distribution
CH_4	Methane
CHPH	Canal Head Power House
CMP	Meeting of Parties (Kyoto Protocol)
CMT	Cubic Million Tonne
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of the Parties
CPCB	Central Pollution Control Board
CPSU	Central Public Sector Undertakings
CRV	Climate Resilient Varieties
CRZ	Coastal Regulation Zone
DAC	Department of Agriculture & Corporation
DELP	Domestic Efficient Lighting Programme
DISCOMS	Distribution Companies
DPR	Detail Project Report
DRMP	Disaster Risk Management Programme
DSR	Direct Seeded Rice
EA	Triennium
EAM	Enterprise Asset Management
EC	Empowered Committee
ECBC	Energy Conservation Building Code
ECN	Energy Research Centre of the Netherlands
ENSO	El Nino Southern Oscillation
EPC	Engineering, Production & Construction

FOB	Fly Over Bridge
FRP	Fibreglass Reinforced Plastic
GACL	Gujarat Alkalies& Chemicals Ltd.
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEDA	Gujarat Energy Development Agency
GERMI	Gujarat Energy Research & Management Institute
GETCO	Gujarat Energy Transmission Company
GHG	Green House Gas
GIDM	Gujarat Institute of Disaster Management
GIM	Green India Mission
GIPCL	Gujarat Industries & Power Corporation Ltd.
GoG	Government of Gujarat
GoI	Government of India
GP	Garur Puran
GPEC	Gujarat Paguthan Energy Corporation
GPI	Grossly Polluting Index
GPS	Gas Power station
GSDMA	Gujarat State Disaster Management Authority
GSDP	Gross state Domestic Product
GSECL	Gujarat State Electricity Corporation Limited
GSM	Global System for Mobile
GSPC	Gujarat State Petroleum Corporation
GUVNL	Gujarat UrjaVikas Nigam Limited
GW	Giga Watt
GWP	Global Warming Potential
H_2S	Hydrogen Sulphide
ha	Hectare
HC	Hydro Carbon
HFC	Hydro Fluoro Carbon
HH	His Holiness
HP	Horse Power
HPGP	High Pressure Gas Pipeline
HPSC	High Powered Steering Committee
HPSEBL	Himachal Pradesh State electric board
HR	Head Regulator

HRVA	Hazard Risk and Vulnerability Atlas
ICAR	Indian Council for Agricultural Research
IEC	Information, Education and Communication
IECC	India Endowment on Climate Change
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
INDC	Intended Nationally Determined Contribution
InSPA	International Agency for Solar Policy & Application
IPCC	Intergovernmental Panel on Climate Change
IPDS	Integrated Power Development Scheme
ISA	Implementation Support Agencies
ISRO	Indian Space Research Organization
ITI	Industrial Training Institute
JDI	Joint Declaration of Intent
JNNSM	Jawaharlal Nehru National Solar Mission
JVC	Joint Venture Company
JWG	Joint Working Group
kg	Kilogram
KLTPS	Kutch Lignite Thermal Power Station
km	Kilometre
km^2	Square Kilometre
KV	Kilovolt
kVA	Kilovolt Ampere
kW	Kilo Watt
kWh	Kilo Watt Hour (unit)
LE	Life Extension
LED	Light Emitting Diode
LOA	Letter of Authorization
LPD	Liters per Day
LPG	Liquefied Petroleum Gas
m	Metre
m^2	Square Metre
m^3	Cubic Metre
MAF	Million Acre Feet
MBI	Market-based Instrument
Mcft	Million Cubic Feet

MCM	Million Cubic Metre
MDGs	Millennium Development Goals
mg	Milligram
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
MI	Micro Irrigation
MIDH	Mission for Integrated Development of Horticulture
MkWh	Million Kilo Watt Hour
MLD	Million Litres per Day
MMSCMD	Million Metric Standard Cubic Metre Per Day
MNRE	Ministry of New and Renewable Energy
MoDWS	Ministry of Drinking Water and Sanitation
MoEF & CC	Ministry of Environment, Forest and Climate Change
MoU	Memorandum of Understanding
MoWR, RD&GR	Ministry of Water Resources, River Development & Ganga Rejuvenation
MRV	Measurement, Reporting and Verification
MT	Metric Tonne
MU	Million Units
MUDRA	Micro Units Development and Refinance Agency
MW	Megawatts
MWh	Mega Watt Hour
N_2O	Nitrogen Oxide
NABARD	National Bank for Agriculture and Rural Development
NAM	National Agroforestry Mission
NAME & T	National Mission on Agriculture Extension & Technologies
NAP	National Agroforestry Policy
NAPCC	National Action Plan on Climate Change
NAQUIM	National Project on Aquifer Management
NBA	National Biodiversity Authority
NBM	National Bamboo Mission
NBWUE	National Bureau of Water Use Efficiency
NCEF	National Clean Energy Fund
NCMRWF	National Centre for Medium Range Weather Forecasting
NCRMP	National Cyclone Risk Mitigation Project
ND	Not Detectable
NDA	National Designated Authority
NDE	National Designated Entity

NDMA	National Disaster Management Authority
NFSM	National Food Security Mission
NGO	Non Governmental Organization
NICCSA	National Institute for Climate Change Studies and Actions
NICRA	National Innovations on Climate Resilient Agriculture
NIE	National Implementing Entity
NIH	National Institute of Hydrology
NIRD & PR	National Institute Rural Development & Panchayati Raj
NISE	National Institute of Solar Energy
NMCA	National Mission on Coastal Areas
NMCG	National Mission for Clean Ganga
NMOOP	National Mission on Oilseeds and Oil palm
NMSA	National Mission for sustainable Agriculture
NOx	Nitrogen Oxide
NPMCR	National Policy for Management of Crop Residues
NRSC	National Remote Sensing Centre
NSGM	National Smart Grid Mission
NSSO	National Sample Survey Organisation
NTPC	National thermal Power Corporation
NWM	National Water Mission
O&M	Operation and Maintenance
PAF	Plant Availability Factor
PAIS	Pollution Assesment and Inventorization Scheme
PAT	Perform Achieve and Trade
PDPU	PanditDeendayal Petroleum University
PGS	Participatory Guarantee System
pH	Potential of Hydrogen
PHCs	Primary Health Centres
PIM	Participatory Irrigation Management
PKVY	Parmparagat Krishi Vikas Yojana
PLF	Plant Load Factor
PM	Particulate Matter
PMCCC	Prime Minister's Council on Climate Change
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
PNG	Piped Natural Gas
PMJDY	Pradhan Mantri Jan Dhan Yojna

ppm	Parts Per Million
PSPCL	Punjab State Power Corporation
PSU	Public Sector Undertakings
R&D	Research & Development
R&M	Renovation & Modernization
RAPDRP	Restructured Accelerated Power development and Reforms Programme
RBPH	River Bed Power House
RCC	Reinforced Cement Concrete
RE	Renewable Energy
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
RE-INVEST	Renewable Energy Global Investors Meet & Expo
RKVY	Rashtriya Krishi Vikas Yojana
RPO	Renewable Purchase Obligation
RRR	Repair, Renovation & Restoration
Rs. (₹)	Indian Rupees
RSPM	Respirable Suspended Particulate Matter
RV	Rig Veda
SAARC	South Asian Association for Regional Cooperation
SAC	Space Application Center
SBM	Swachh Bharat Mission
SDGs	Sustainable Development Goals
SEC	Specific Energy Consumption
SEDMC	SAARC Environment and Disaster Management centre
SGPP	Sewage Gas based Power Plant
SHC	Soil Health Card
SLNP	Street Lighting National Programme
SMAM	Sub Mission on Agricultural Mechanization
SMC	Surat Municipal Corporation
SO_2	Sulphur Dioxide
SOPs	Standard Operating Procedures
SOx	Sulphur Oxide
SPCB	State Pollution Control Board
SPG	Solar Power Generators
SPM	Suspended Particulate Matter
SPPWCP	Sardar Patel Participatory Water Conservation Project
SPV	Solar Photovoltaic

SRDC	Solar Research Development Centre
SRFD	Sabarmati Riverfront Development Project
SRFDCL	Sabarmati River Front Development Corporation Ltd.
SRGP	Sustained Red Green & Blue Light
SRI	System of Rice Intensification
SSP	SardarSarovar Project
ST	Solar Thermal
STP	Sewage Treatment Plant
T&D	Transmission and Distribution
TA	Triennium
TBO	Tree Borne Oilseeds
tCO_2	Tonne Carbon Dioxide
TEK	Traditional Environmental Knowledge
TERI	The Energy and Resources Institute
TISS	Tata Institute of Social Sciences
TOT	Training of Trainers
TR	Ton of refrigeration
UGVCL	Uttar Gujarat Vij Company Ltd.
UHBVNL	Uttar Haryana Bijli Vij Nigam Limited
ULB	Urban Local Bodies
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNICEF	United Nations Children's Fund
VGF	Viability Gap Funding
VGGIS	Vibrant Gujarat Global Investors' Summit
VWSC	Village Water and Sanitation Committee
WASMO	Water & Sanitation Management Organisation
WBSEDCL	West Bengal State Electricity Distribution Company
WPG	Wind Power Generation
WTG	Wind Turbine Generator
WUAs	Water User Associations
ZED	Zero Effect, Zero Defect

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